PROJECT INFORMATION MEMORANDUM (PIM)

VOLUME (IV)

INTEGRATED SOLID WASTE MANAGEMENT FOR JURISDICTIONAL AREA OF

BBMP & BENGALURU URBAN DISTRICT

BENGALURU SOLID WASTE MANAGEMENT LIMITED
#30/1, THIMMAIAH ROAD, MILLERS TANK BUND AREA, VASANTHNAGAR, BENGALURU-560 052

DISCLAIMER

This Project Information Memorandum (PIM) is to provide an overview of the existing facilities and the status of Solid Waste Management and handling processes. The information contained herein is based on field surveys and data collected from BBMP offices, survey and various reports collected from various departments/ online on Garbage Venerable Points (GVP), MSW assessment of Bengaluru city and a case study of Bengaluru by Kashyap Shwetmala, H.N. Chanakya, TV Ramachandra on “Pattern, Characterization and Quantification of Unauthorized waste dump sites”.

It is important to note that the PIM is intended to offer a general understanding of the current situation, and the assessment of such facilities shall be an integral part of the Bidder's responsibility. This document is meant to serve as a reference and initial guide for interested parties, and it is recommended that Bidders or Applicants conduct their own due diligence and comprehensive assessments to ensure accurate and up-to-date information before participating in bidding process.

While every effort has been made to ensure the accuracy and reliability of the information presented, however, BSWML shall not be held responsible for any discrepancies, omissions, or changes that may arise on the publication of this document. Any reliance on the contents of this PIM is done so at the sole discretion and risk of the reader or user. This disclaimer underscores the importance of independent verification and assessment when considering participation in projects related to Solid Waste Management and any other associated activities of the bidding process.

Executive Summary

1. Introduction:

Project means the project for enabling collection, transportation, construction of Processing Facility, processing and disposal of SW in the Scientific Landfill and for that purpose to design, develop, finance, construct, operate and maintain the Plant, under and in accordance with the terms and provisions of this Agreement.

Integrated Solid Waste Management facility has been conceived to provide a comprehensive solution to Bengaluru City to process the solid waste at various locations based on the requirement of the project. The integrated Solid Waste Management is Processing of Solid Waste (SW) by which it is transformed into new or recycled products by adopting the intending bidders who are expected to establish the process such as bio-methanation, RDF, palletization, Waste Energy to generate electricity or any other and all such technologies proposed to process the waste must be a Proven and approved Technologies by either CPCB/MOUHA/SBM-20/ any state PCB or any wherein the world in accordance to the standards set forth in the Background Documents, SWM Rules 2016, NGT orders and Applicable Law, rules and required to adhere to follow the amended rule/ orders on time to time during the concession period.

2. Salient features

- The proposed Integrated Solid Waste Management proposal is aimed to provide cover the total jurisdictional area of 2160.00 Sq. Kms. which covers the entire BBMP jurisdiction plus Bengaluru Urban district area.
- The BBMP jurisdiction has got 198 wards presently and amended to 225 Wards with 30 division under 8 Parliamentary Constitutions.
- The population within project jurisdiction is about 1.47 Crore and generates about 8096 TPD (1.47 cr. population @ 550gm/day/capita of waste generation; including the Bulk waste generation) Solid waste from various sources and about 670 TPD is generated through street sweeping. However, for the Collection and transportation work as given in scope of work, the estimated Solid waste is assessed as 14.7 cr. Population @ 400gm/day/capita; i.e. 6581 TPD. Hereby, the estimated quantum of Solid waste shall be considered as 6581 TPD for the C&T work purpose.
- The Average distance for primary Collection & Transportation is within 5 Kms in BBMP area and between collection point to secondary transfer point and from Secondary transfer point to processing centre of corresponding package on average is 40.00 Kms for to & fro.
- Land parcels for the ISWM Processing facility is identified about 50.0 Acres normal land and about 50.00 Acres of quarry pit (within 5 km of the ISWM processing Facility) for each package. The accessibility to the processing center needs to well

acquaintance by concessionaire before pre bid meeting and confirm the same in pre bid conference

- The waste quantities, population projections are only indicative to give the fair idea to the bidders. The actual waste quantities, distances to travel, number of household and all relevant information has to be established by the bidders on your own and Authority will not hold the responsibility for the same.
- All intending bidders will be required prepare their own assessment, methodology, technologies and arrive the suitable tipping fee for the entire scope

3. Package wise Details of Collection and Transportation Works

C&T	Population	Tonnage (TPD)	Divisions/ Transfer Stations	No of Auto Tippers	Containers	Hook Loaders
Package 1	2751567	1232	6	607	109	40
Package 2	4238181	1849	9	946	168	62
Package 3	3423111	1528	6	730	135	50
Package 4	4307205	1922	9	909	170	63
	14720064	6581	30	3192	582	215

Table1: Proposed Minimum requirement of Vehicles for C&T

Note: -1. The waste Quantum Estimates has been derived by considering 400gm/day/capita of waste generation within the BBMP limits and 350gm/day/capita of waste generation in Bengaluru urban district excluding the Bulk waste Generators wate as at present BWG waste being transported directly by the BWG. A government notification may come into force to include the BWG Waste also to be transported by the same concessionaire of the corresponding packages but at the mutual consent for the rates between BSWML and concessionaire.

2. *The existing C&T contracts of BSWML shall continue to operate as per the contract conditions. The concessionaires of ISWM Packages are advised accordingly to make their scope of C&T which has been mention in RFP vide Clause 3.2 (Scope of work of the Concessionaire.)*

4. Package wise details of Processing and Disposal work

Sl No.	Zones	Divisions	Population	TPD
1	Yalahanka & Dasarahalli (Package 1)	6	2751567	1246
2	RR Nagar & West zone (Package 2)	9	4238181	1920
3	East zone & Mahadevapura (Package 3)	6	3423111	1550
4	South zone & Bommanahalli Package 4)	9	4307205	1951
	Total		**14720064**	**6667**

Table2: Estimated waste quantum at ISWM Facility at respective packages

Note: The Estimated waste quantum per package has been arrived by considering 550gm/day/capita (waste for P&D works includes waste of BWG's) of waste

generation for the proposed Processing and disposal work after discounting the Waste for existing commitments of BBMP.

GLOSSARY

SL. NO.	ABBREVIATIONS	FULL FORM
1.	BBMP	Bruhat Bengaluru Mahanagara Palike
2.	BSWML	Bengaluru Solid Waste Management Limited
3.	CAPEX	Capital Expenditure
4.	C&T	Collection & Transportation
5.	CPCB	Central Pollution Control Board
6.	CERC	Central Electricity Regulatory Commission
7.	CNG	Compressed Natural Gas
8.	CPHEEO	Central Public Health and Environmental Engineering Organization
9.	DPR	Detailed Project Report
10.	DBFOT	Design Built Finance Operate and Transfer
11.	DBO	Design, Build, Operate
12.	DWCC	Dry Waste Collection Centres
13.	EPC	Engineering, Procurement, Construction
14.	GVP	Garbage Vulnerable Point
15.	GHG	Green House Gases
16.	G.o.K	Government of Karnataka
17.	GoI	Government of India
18.	GVW	Gross Vehicle Weight
19.	IEC	Information, Education, and Communication
20.	ISWM	Integrated Solid Waste Management
21.	IT	Income Tax
22.	KCDC	Karnataka Compost Development Corporation
23.	KSERC	Karnataka State Electricity Regulatory Commission
24.	KLD	Kilolitres per Day
25.	LTP	Leachate Treatment Plant
26.	MAT	Minimum Alternate Tax
27.	MRF	Material Recycling Facility
28.	SW	Solid Waste
29.	SWM	Solid Waste Management
30.	MoHUA	Ministry of Housing and Urban Affairs
31.	MTS	Mini Transfer Station
32.	MW	Megawatt
33.	O&M	Operation & Maintenance
34.	OPEX	Operational Expenditure
35.	PIM	Project Information Memorandum
36.	PPP	Public Private Partnership
37.	P&D	Processing & Disposal
38.	PNG	Petroleum and Natural Gas
39.	PMC	Project Management Consultants

40.	RDF	Refuse Derived Fuel
41.	SERC	State Electricity Regulatory Commission
42.	SLF	Sanitary Landfill
43.	SPCB	State Pollution Control Board
44.	SCTPs	Secondary Collection and Transfer Points
45.	SWM	Solid Waste Management
46.	SW	Solid Waste
47.	TEFR	Technical Economical and Financial Report
48.	TPD	Tonnes per Day
49.	ULB	Urban Local Bodies
50.	UDD	Urban Development Department
51.	BUD	Bengaluru Urban District
52.	UN	United Nations
53.	FINANCIAL GRANT UNDER SBM 2.0	Viability Gap Fund
54.	WTE	Waste to Energy
55.	YoY	Year on Year

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1 INTRODUCTION

1.1 Understanding of the Project:

Waste management is one of the most pressing issues for governmental authorities in India due to rising urbanisation, increase in waste generation and types of waste, lack of space for waste processing facilities, limited financial resources and inadequate waste management systems and infrastructure. In this context, the Solid Waste Management Rules, 2016 ("SWM Rules 2016") were framed by the Ministry of Environment, Forest and Climate Change to address the issue of solid waste management and identify the roles and responsibilities of different stakeholders including government bodies and the waste generators in the solid waste management ecosystem. Under the SWM Rules 2016, the urban local bodies ("ULB") are responsible for implementation of these rules within their jurisdictions.

The rapid increase in waste generation is demanding for a renewed attention to the increasing problem of Solid Waste management. In this context, BBMP will adopt an integrated waste management system that implements a waste management hierarchy with the aim to reduce the amount of waste being disposed of, while maximising recovery of resources and resource conservation. It is closely linked to the 4R approach (reduce, reuse, recycle and recover) and principles of circular economy which also emphasises the importance of waste reduction, reuse, recovery and recycling over other forms of waste processing or management.

Presently, Bengaluru is facing significant problems due to existing disposal practices of generated waste incurring high COST due to lack of proper planned infrastructural facilities; the open dumping in the expanding zone of the city poses severe problems to the structures constructed on these old dumps. In the meantime, groundwater quality deteriorated due to improper leachate management

The Bengaluru Solid Waste Management Limited (BSWML) intends to select a suitable concessionaire for carrying out the work relating to collection and transportation of the Primary & Secondary Transportation besides establishment of Integrated Processing facilities at various locations to Treat SW in the jurisdiction of Bengaluru Urban District covering about an area of 2,160 Sq. Kms in compliance with the Solid Waste Management 2016 rules under various options based on the reasonability of the Capital and O&M COST.

While the Solid Waste Management Rules 2016 make it mandatory for urban local bodies to handle solid waste management, the actual practice often relegates waste management to a less priority. As a result, these duties are either not performed or executed inadequately,

leading to numerous environmental and sanitation issues for any city. The following are some of the key challenges associated with the existing system of Solid Waste management.

a. **Rapidly Expanding Areas and Increasing Waste Generation:** The quantities of solid waste generated in urban areas is a factor of change of land use, growth in city either in the vertical or horizontal and increase in population. These are either planned or unplanned. In case of Bengaluru the city is expanding in all directions and the existing land uses is changing. Being one of the major nuclei of IT hub and associated infrastructure the city has shown the maximum growth. This has led to urbanisation which thereby has led to increase in waste generation. Also, the socio-economic condition of the people has improved leading to growth in per capita growth in waste generation.

b. **Resource Shortages:** Due to expansion in the city and spread and growth of population the areas to be served for solid waste management are strained. In Bengaluru the existing infrastructure does not receive the focus because of the location of existing processing facilities (Wet waste processing facilities) and there by affecting the services. The resources are not augmented with the speed and number which leads to compromise in quality of services and creating of garbage vulnerable points in the city and increasing in dumping grounds. Also, in pursuit to provide road, drains and water supply and other basic infrastructure. The existing Solid Waste Management System often receives lower priority when allocating resources, resulting in insufficient funding and a lack of trained personnel.

c. **Use of Inappropriate Technology:** With change in population and the existing equipment and machinery which in use are not pursuant to the requirement as they were often repurposed for a defined load and capacity. The same is not able to cope up the pressure. The equipment and machinery which are sourced from other industries lead to underutilization of existing resources and reduced efficiency.

d. **High COST of Manpower:** A significant portion of expenditure, is spent on manpower, with most resources directed towards waste collection. Improper practices, such as littering on roadsides, lead to increased collection work, directly affecting COSTs. The resource recovery and disposal which should be also be one of the main focus areas is not allocated with trained and skilled manpower there by affecting any waste management. This leads to opening dumping and no focus on resources recovery, scientific treatment and disposal of waste.

e. **Low System Efficiency**: The SWM system lacks proper planning and operates in an unscientific manner. Work norms are often unspecified, and there is inadequate supervision of collection and transportation staff as there is no proper mechanism of Attendance recording. Vehicles are not adequately maintained, and no

preventive maintenance schedule is adhered to. There is also a lack of coordination among different components of the system, resulting in an inefficient SWM system.

f. Urbanization: Urbanization is a global trend, and its impact is more pronounced in developing countries. High population growth, reduced opportunities in rural areas, and a shift from low-paying agricultural occupations to higher-paying urban jobs contribute to urbanization. This, in turn, leads to increased waste generation due to changes in lifestyle, further exacerbating health risks and urban environmental degradation. The growth in urbanization and consumerism makes Solid Waste Management an increasingly challenging task in India. Financial constraints, institutional weaknesses, inappropriate technology choices, and public indifference toward Solid Waste (SW) have compounded the issue.

g. At present Bangalore city has established some of the compost processing centres at 7 locations operated by BBMP and one Operated by Private Agency. So, the total quantity proposed to operate under this processing facilities is only 2,300TPD against the total waste generated 6581 TPD, (excluding bulk waste generators) which is a huge gap resulting in the unscientific treatment and management of waste and there by disposal in Landfill/ Dumping grounds.

h. The Present Transport mechanism is also under numerous packages which are under purview of BBMP. In the managing of these packages without having any Transfer Station facility resulting in haphazard way of transporting from Primary C&T to the Secondary Transportation Vehicles, Either on road side or at public places.

i. The present Vehicles does not have the required leachate Collection/ management within the vehicles which is resulting the leakage of Leachate on transportation corridors there by resulting in ill management.

The civic responsibilities and infrastructure assets in Bengaluru are overseen by BBMP, the administrative body. The SWM cell of BBMP encounters distinctive challenges in managing the city's waste. To enhance comprehension, let's classify the challenges as outlined below: -

a) Structural Challenges

- Hierarchical management system
- Financial Limitations: The absence of financial planning and provisions for scientific waste processing and disposal methods further results in inadequate allocation of funds for SWM services.

b) Operational Challenges

- Insufficient utilization of processing plants: The existing processing facilities are operating significantly below their designed capacities due to accessibility issues.
- Failure to expand processing capacity: There are some processing facilities being planned to treat the SWM Waste such as Small Scale Bio Gas Plants, Self-supported DWCC's operated by NGO's which has resulted in not meeting the comprehensive Processing requirements.
- Landfill and health concerns: Poor waste management practices in landfills pose a significant risk to residents in nearby areas and results in public outreach.
- Scientific Approach for C&T and P&D: This is yet to be established hence the proper Integrated Solid Waste Management Plant as per the standards/ guidelines set by CPCB, CPHEEO manual is required to be established.
- Inadequate contract management and M&E: BBMP outsources collection and transportation activities to contractors, but the absence of clear quality benchmarks contributes to a lack of accountability and standardization in these activities. Ineffectual Monitoring and Evaluation exacerbate inefficiencies throughout the value chain.

c) Challenges in SWM Value Chain

1. Solid Waste Collection

The collection of waste from residential and commercial areas is a crucial aspect that marks the initial step in the Solid Waste Management (SWM) process, influencing the effectiveness of subsequent processes in the value chain. Inefficient collection processes often result in unscientific waste littering in open spaces. According to the Bengaluru SWM Bye-Laws (2020), wet and sanitary waste should be collected daily, while dry waste should be collected two to three times a week. Presently, BBMP has delegated the collection and transportation tasks to contractors responsible for door-to-door collection activities. Despite the intended efficiency of this model, it encounters the following challenges:

- Low levels of waste segregation: Bengaluru's SWM experiences significant inefficiencies due to insufficient segregation of various waste streams. Factors contributing to low segregation levels include limited public awareness, inadequate training, mismanagement of waste by contractors, and a lack of efficient monitoring systems. In the absence of segregated waste, a substantial portion of the collected waste becomes challenging to process and ends up in landfills.
- Lack of a data management system: Effective waste collection necessitates micro planning of expected waste quantities, collection routes, and other operational aspects. Such planning relies on reliable data depicting seasonal trends and

variations. Currently, Bengaluru lacks these systems, leading to inadequate planning.

2. *Solid Waste Transportation*

Waste transportation plays a crucial role in maintaining the cleanliness of the city and is a key factor in determining the COST efficiency of the process. Bengaluru's Solid Waste Management (SWM) faces the following challenges in the transportation of collected waste:

- Unscientific transportation vehicles: Bengaluru's transportation infrastructure is not adequately designed to handle large volumes of waste, resulting in leachate seepage during the transportation process. This leads to unpleasant odours and unhealthy conditions for residents in areas traversed by these vehicles. Typically, these vehicles lack sufficient monitoring systems, such as a global positioning system (GPS), contributing to the mismanagement of waste.
- Lack of well-established transfer stations: Transfer stations facilitate the transfer of collected waste to larger vehicles for convenient transportation to the final destination. Without defined transfer stations, Bengaluru encounters the challenge of multiple small vehicles transporting waste to processing units, leading to unscientific disposal of waste at times and an increase in transportation COSTs.
- Lack of well-defined segregation points for dry waste: Although Dry Waste Collection Centers (DWCCs) contribute to waste segregation at the ward level, there is no structured mechanism for collecting segregated waste from them. While high-value and recyclable waste is sold to recyclers, the absence of an aggregation point for dry waste results in inefficient management of low or no-value waste, leading to unscientific disposal.

3. *Challenges in SW Processing*

BBMP is currently grappling with significant challenges in processing waste effectively, evident from the fact that approximately 80 percent of the waste is currently being directed to landfills.

In Bengaluru, waste processing predominantly centers on the treatment of wet and dry waste. Dry waste is managed through Dry Waste Collection Centers (DWCCs) established in 147 wards, however 119 are functional and overseen by the NGO's/ Contractors appointed by BBMP. These centers engage informal waste pickers, offering them an alternative livelihood opportunity. Presently, only 119 out of the city's 215 wards have operational DWCCs, recovering a mere 20 percent of valuables from the collected waste.

For wet waste processing, BBMP operates both centralized and decentralized facilities. The decentralized facilities include 12 Biomethanation plants, of which

only 2 are currently operational, leaving 84 percent of the capacity unused. Additionally, BBMP owns seven centralized windrow composting facilities strategically located throughout the city and has partnered with a private processing facility, resulting in a combined daily capacity of 1770 MT. However, at present, Substantial fraction of the Total SW capacity remains untapped.

4. *Challenges in Waste Disposal*

As of now 70% to 80% of the waste is being disposed at the disposal site without any proper treatment and due to which there is rising concern not only land availability but also unscientific manner of waste dumping which is further leading to environment deterioration.

1.2 An overview of project jurisdiction:

The proposed study covers the area of Bangalore Urban District along with the BBMP Jurisdictions.

i. Bengaluru Urban District: The urban district covers about 1450 sq. km with the population of about 5.32 Lakhs (appox.) which covers the 86 villages majorly in five divisions i.e. Anekal, Yelahanka, Byatarayanapura, Yeshwanthpur, Kengeri and Mahadevapura.

ii. Jurisdiction of the BBMP: The BBMP covers an area of about 714 sq. km with the population of 1.32 Crores (approximately) and floating population of 9.78 Lakhs (based on Dr. Hoysall N Chanakya report on floating population). There are about 225 wards amalgamated into 30 divisions/ Assembly constituencies and these divisions are further amalgamated to 8 Zones (MP Constituencies).

1.3 Bengaluru urban district

Bengaluru, is the capital city of Karnataka, which is also the Headquarter of the Bengaluru Urban District located on the Deccan plateau at an elevation of approximately 920 meters (3,018 feet) above sea level in the south eastern part of Karnataka. Bengaluru urban district is spread across 4 Talukas namely Bengaluru North, Bengaluru East, Bengaluru South and Anekal, Bengaluru is renowned and well known as the "Silicon Valley of India" due to its prominent role in the field of information technology and innovations. Bengaluru has a rich history of ancient times and was part of various dynasties, including the Cholas, Hoysalas, and Vijayanagara Empire. The city's modern development, however, gained momentum during the British colonial period. It served as a cantonment area and administrative centre for the British, contributing to its urban growth as well.

The regions exhibit two primary types of soils i.e. red loamy soil and lateritic soil. Red loamy soils are typically found on hilly to undulating slopes in granite and gneissic terrains, predominantly in the eastern and southern parts of Bangalore. On the other

hand, laterite soils are present on undulating terrain, creating a flat to gently sloping topography in the peninsular gneissic region.

The climate in Bangalore is moderate, with relatively mild temperatures (ranging between 16°C to 32°C) year-round due to its elevation. Summers (March to June) are warm, while monsoons (June to September) bring heavy rainfall. Winters (October to February) are cooler and more comfortable, making it an attractive destination for visitors.

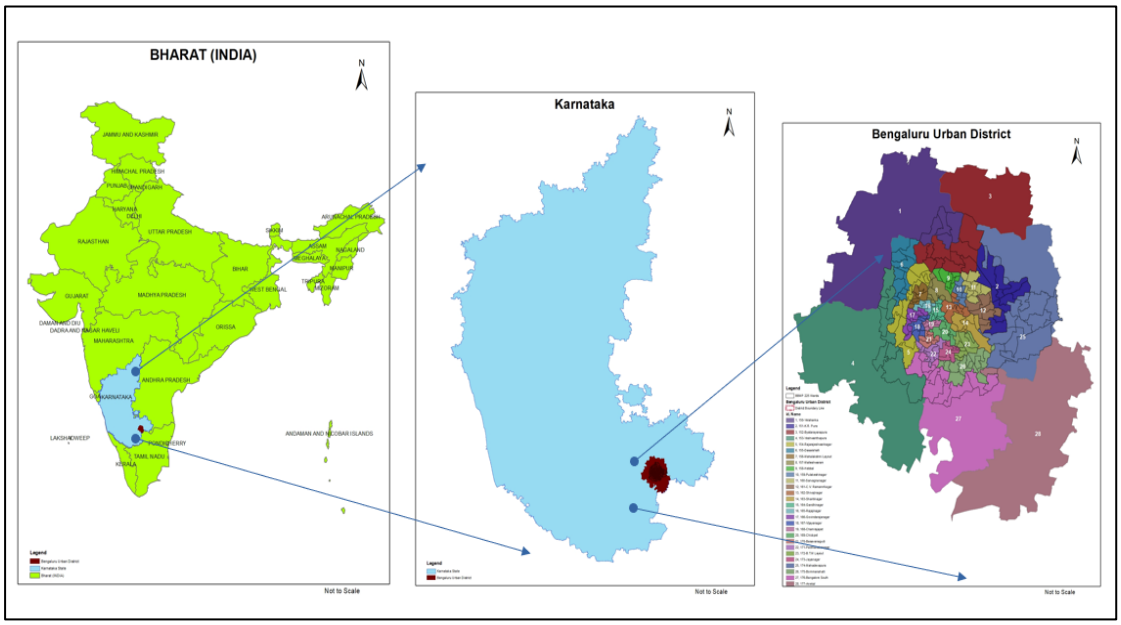


Figure 1: Map of Bengaluru Urban District

1.4 Population growth

Bangalore underwent swift expansion during the period from 1941 to 1951, becoming the sixth-largest city in India by 1961. Between 1991 and 2001, Bangalore emerged as the fastest-growing metropolis in India, experiencing a remarkable growth rate of 38% during that decade. In the 2001 census, the city's population was recorded at 56.86 lakh, but the new draft of the City Development Plan by BDA considered the inclusion of population in peripheral villages, estimating the metropolitan area's population to be 61.70 lakh.

The population growth of Bangalore is evident when comparing census figures from 1981, 1991, 2001, 2011, and beyond, with the city's population standing at 2.92 million, 4.13 million, 5.10 million, and 8.42 million, respectively. Projections suggest that the population of Bangalore Urban Agglomeration (BUA i.e. BBMP Population and Urban District) is expected to reach approximately 13.32 million (excluding Floating Population) and 14.77 Million (including Floating Population) by 2023. A key factor contributing to this substantial growth is the cosmopolitan nature of the city, drawing people from diverse locations, particularly as a prominent IT hub in South India.

With the rapid urbanization, waste generation has surged from 80 TPD to 8,096 TPD (1.47 cr. Population @550gm/day/capita as per technical guidance committee) over seven decades since 1941. These statistics place considerable strain on all civic infrastructure services, including Solid Waste (SWM) management.

1.5 Bruhat Bengaluru Mahanagara Palike

Bruhat Bengaluru Mahanagara Palike (BBMP) is the Nodal agency for this project and the administrative body responsible for civic amenities and social infrastructural development for the Bengaluru. Also, the Bruhat Bengaluru Mahanagara Palike has a council that consists of 225 elected members of councillors, each representing a ward for public administration. Both the mayor and deputy mayor are chosen from the councillors itself for a period of 1-year term to 5-year term. For a more efficient and effective administration, the Bengaluru City has been divided into 8 different administrative zones/ Sanitary Zones covering 225 administrative or political wards.

Hierarchical Mapping of Bengaluru City

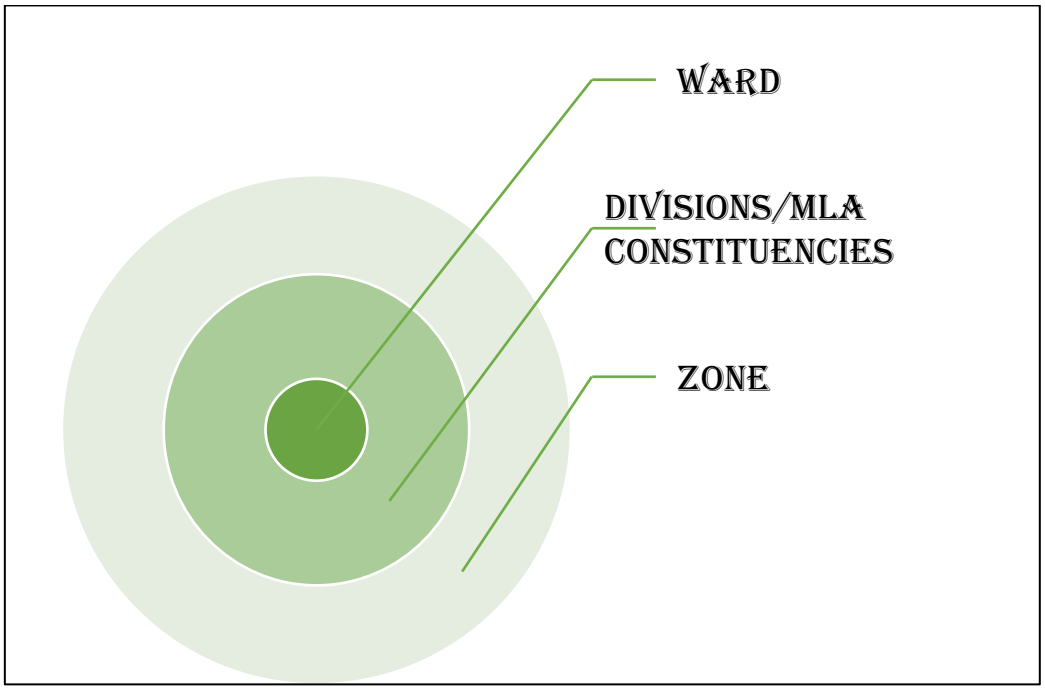


Figure 2: Hierarchical Mapping of Bengaluru City

The most elementary administrative division within Bengaluru city, overseen by the BBMP, is the ward, where councillors are elected. There are 225 wards, each falling within the divisions/MLA constituencies of the Karnataka State Legislative Assembly, totalling 30 such divisions/constituencies. These, in turn, are organized under eight sanitary zones, reflecting a hierarchical structure designed to facilitate the efficient and effective management of BBMP's operations.

Zone Name	No of Divisions
Dasarahalli	30
West Zone	
RR Nagar	
Yelahanka	
East Zone	
Mahadevpura	
South Zone	
Bommanahalli	

Table3: Zone Divisions

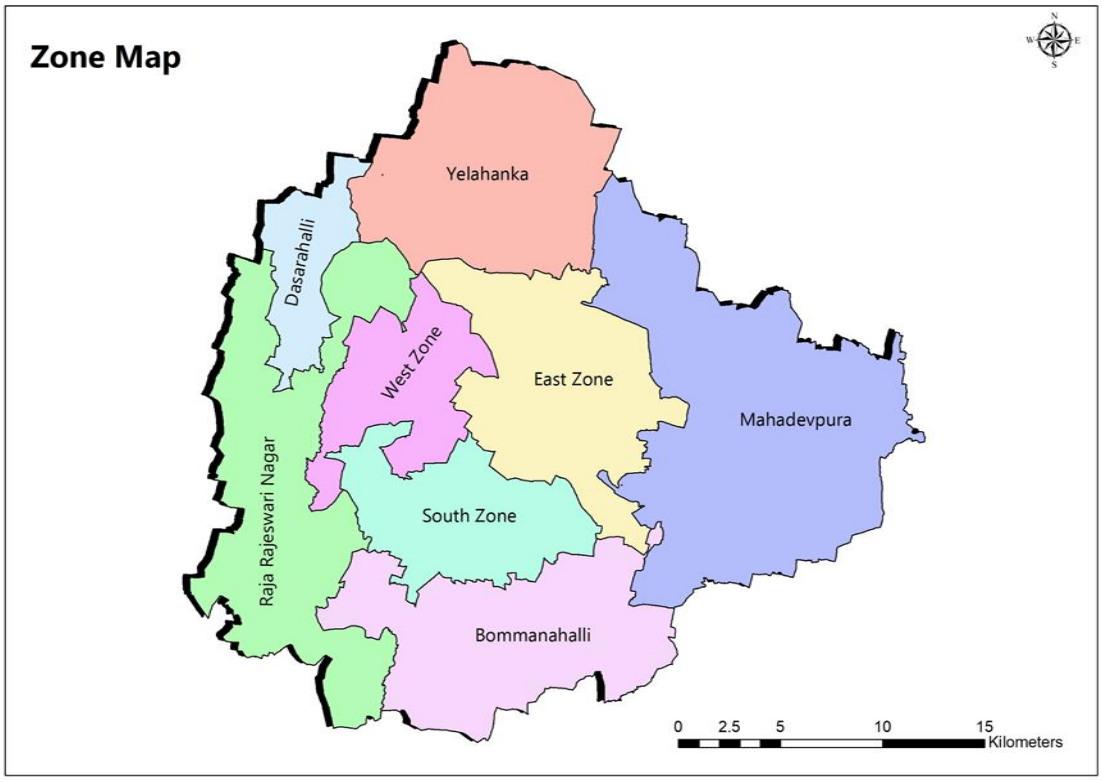


Figure 3: Zone wise map

Formation and Jurisdiction: BBMP was formed in 2007 by merging the Bangalore Mahanagara Palike (BMP) with several surrounding municipalities and panchayats. This merger was intended to create a single administrative body for the entire urban area of Bangalore.

Administrative Structure: BBMP is headed by a Mayor who is elected by the members of the BBMP Council. The council consists of elected representatives called corporators, who are elected by the residents of various wards within the BBMP's jurisdiction.

Bruhat Bengaluru Mahanagara Palike is headed by the Chief Commissioner who is appointed and deputed by the State Government of Karnataka for performing duties and functions of municipal corporation such as

- Urban planning and development.
- Road and transportation infrastructure.
- Water supply and sanitation.
- Waste management and garbage collection.
- Health and hygiene services.
- Property tax collection.
- Birth and death registration.
- Building permits and regulation.
- Parks and green spaces maintenance.
- Challenges and Development Initiatives.

Bangalore has experienced rapid urbanization and population growth, leading to various challenges such as traffic congestion, infrastructure development, and environmental concerns. BBMP has initiated several projects and programs to address these challenges, including the development of the metro rail system, road expansion projects, and efforts to improve waste management and green spaces.

- Political Structure: BBMP is governed by a council with a mix of elected representatives from various political parties. The political landscape may change with each municipal election.
- Finances: BBMP's revenue primarily comes from property taxes, grants from the state government, and other sources. Managing finances and ensuring adequate funds for infrastructure development and services is a critical aspect of BBMP's responsibilities.

Recently government passed the resolutions to collect the user fee from the domestic waste generators and commercial waste generators (other than the Bulk Waste Generators) through BESCOM through monthly electricity bill for adequate solid waste management within BBMP Limits and fix service charges to BESCOM. The amount so collected shall be deposited in ESCROW account for the purpose so defined.

1.6 Bengaluru Solid Waste Management Limited

Bengaluru Solid Waste Management Limited (BSWML) is a government owned company / exclusive set up made by the Bruhat Bengaluru Mahanagara Palike (BBMP) with independent Board to implement and execute specific solid waste management (SWM) projects to deliver efficient and affordable Integrated Solid Waste Management Project / Infrastructure to the citizens of Bengaluru. Thus, BSWML is the project implementation and monitoring authority for the proposed project.

Bengaluru Solid Waste Management Limited is chaired by Additional Chief Secretary of Government of Karnataka (G.o.K)/ UDD. The Chief Commissioner/BBMP is the Managing Director. The Special Commissioner (BBMP - HQ) is the CEO of the BSWML. There is Board of Directors constituted as per the rules of the company. The Chief Engineer and the Chief General Manager (Tech) is the technical head of the BSWML associated with Engineering staff at various ranks. The overall technical matters shall be reviewed through the technical committee appointed by company as per the extent of the rules. Here in this context of the PIM and related documents pertaining to RFP/DCA/Schedules, the “authority” means Manging Director of BSWML.

2 BENGALURU - SOLID WASTE PROFILE

2.0 Historical Perspective of SWM In Bengaluru

Bengaluru has played a pioneering role in shaping the key milestones of Solid Waste Management (SWM) at the national level. Some noteworthy achievements include:

- The establishment of India's first solid waste processing plant by the Karnataka Compost Development Corporation (KCDC) at Kudlu, Bengaluru in 1975, which remains operational to this day.
- The initiation of the first decentralized community compost unit in Bengaluru by the NGO Waste Wise Trust in 1988.
- The commencement of the first door-to-door collection of segregated waste in Bengaluru by Acts Trust and the Centre for Environment Education in 1990.
- The establishment of the first citizen forum dedicated to addressing SWM, known as the Swabhimana Initiative, for the Bengaluru City Corporation (BCC) in 1998.
- The creation of India's second dry waste collection center in Bengaluru in 2013.
- Bengaluru's recognition as the Best Self Sustainable Mega City in Swachh Sarvekshan 2020.

2.1 Existing System

1. Bengaluru Solid Waste Management Limited is headed by the Chairman and Managing Director/Commissioner of BBMP and Director/Additional Commissioner/ Special Commissioner (SWM.)
2. BSWML through BBMP looks after the effective collection, transportation, processing and disposal of solid waste management. The BBMP is carrying out collection, street sweeping, transportation, processing and disposal of Solid Waste from generators. BBMP has a system of door to door collection for collecting the SW. The SW collected has to be processed before land filling. BBMP has taken several steps to streamline the SW management in the city.

Figure: 4:BBMP Existing system

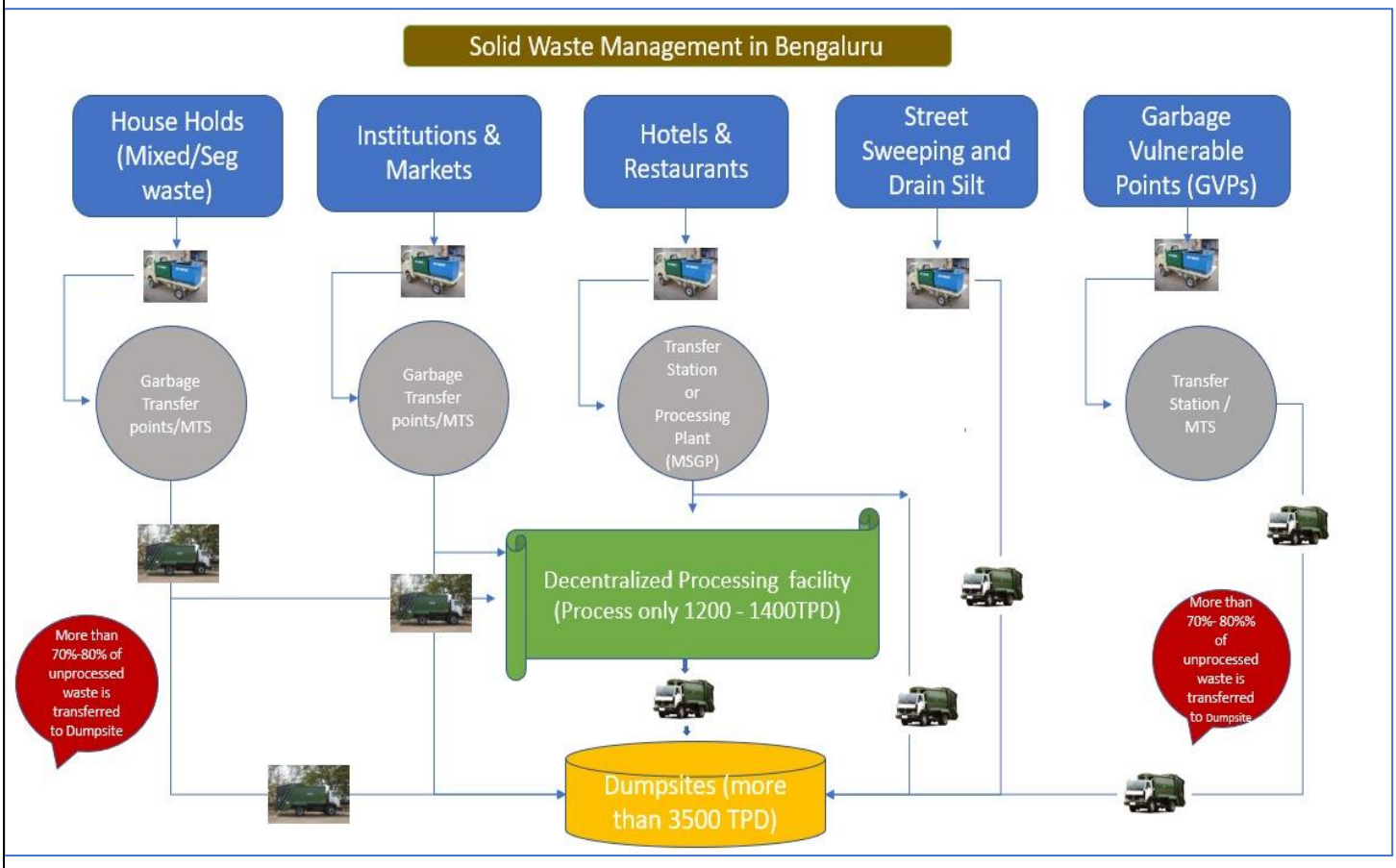

Solid Waste Management in Bengaluru
House Holds (Mixed/Seg waste)
Institutions & Markets
Hotels & Restaurants
Street Sweeping and Drain Silt
Garbage Vulnerable Points (GVPs)
Garbage Transfer points/MTS
Garbage Transfer points/MTS
Transfer Station or Processing Plant (MSGP)
Transfer Station / MTS
Decentralized Processing facility (Process only 1200 - 1400TPD)
More than 70%-80% of unprocessed waste is transferred to Dumpsite
More than 70%- 80%% of unprocessed waste is transferred to Dumpsite
Dumpsites (more than 3500 TPD)

Figure: 5:BBMP Existing system

3. As of BBMP records the above existing C&T is shown considering 5,647 TPD only. However, as per analysis and survey, it is made clear that the Bengaluru city generates approx. 8096 TPD of Solid Waste and Including the Waste Generated by the population residing within the BBMP jurisdiction (i.e. 7265 TPD), population of the Urban District of Bengaluru, other than BBMP limits (i.e. 292 TPD) and the waste Generated by the Floating population (i.e. 538 TPD).
4. The Waste Generated are collected, recycled/ processed (less than 30% of waste Generated) and disposed by Bengaluru Solid Waste Management Limited. This waste includes waste collected from household, commercials, institutions, street sweeping, drain cleaning and bulk waste generators.
5. The solid waste management practices in Bengaluru involve several components, including waste segregation atsource level, door step collection, transportation, processing, and disposal.
6. IEC activities are being intensified and penalties are being levied for non-compliance. The households are required to segregate their wastes into two categories namely wet and dry waste.

School children learn about the valuable contribution of waste-pickers in reducing the amount garbage in the city,
Source: wakeupcleanup.tumblr.com

Figure 6: Awareness to school children

7. The three categories for segregation mandated by BBMP are overwhelming and are a deterrent to segregation. The waste collectors lack training in proper segregation practices and its importance. Incomplete segregation is the predominant practice currently, and steps to realize a higher level of compliance and efficiency need to be increased.
8. Domestic Hazardous waste from household hazardous waste like discarded medicine, sanitary napkins, diapers, batteries, paints etc is collected separately.

9. Burning of Leaves has been prohibited in the city. Awareness is being created on the same Instructions have also been given for composting of leaf litter in nearby parks and open spaces.

10. Municipal workers and private contractors collect waste from households, commercial establishments, and public places (GVPs- Garbage Vulnerable points). There are different bins for segregated wet (organic) and dry (non-organic) waste in the Auto Tippers. The waste collection is divided into different zones or wards. Segregation at source is encouraged to separate organic waste from dry waste. Residents are encouraged to segregate waste into separate bins, promoting better recycling and processing efficiency. Collected waste is loaded onto waste collection vehicles, including compactors and tippers. These vehicles transport waste to waste processing centres or landfills.

L: Hoarding displayed on important street junctions, R: Poster informing citizens about segregation and collection regime

Figure7: IEC Material

Bengaluru has not only been a pioneer in the field of technology but has also served as a role model for the nation in terms of comprehensive development. Nevertheless, over the last two decades, the city has experienced growth at a rate that has outpaced its available resources. The infrastructure necessary to meet the burgeoning demands could not be developed at a commensurate pace. Consequently, what was once referred to as the 'Garden City' has now earned the moniker of the 'Garbage City.' It is imperative for the city to reclaim its pride by urgently addressing the underlying challenges in the structure and functioning of its Solid Waste Management (SWM) system.

2.2 Challenges In BBMP For Effective SWM

The civic responsibilities and infrastructure assets in Bengaluru are overseen by BBMP, the administrative body. The SWM cell of BBMP encounters distinctive challenges in managing the city's waste. To enhance comprehension, let's classify the challenges as outlined below: -

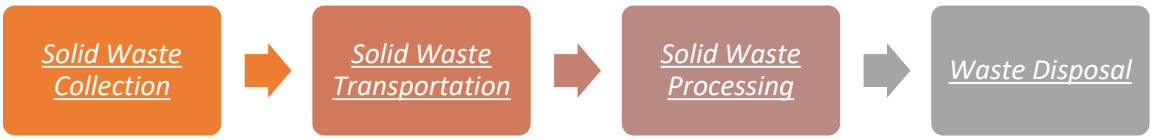
d) Structural Challenges

- Hierarchical management system
- Financial Limitations: The absence of financial planning and provisions for scientific waste processing and disposal methods further results in inadequate allocation of funds for SWM services.

e) Operational Challenges

- Insufficient utilization of processing plants: The existing processing facilities are operating significantly below their designed capacities due to accessibility issues.
- Failure to expand processing capacity: There are some processing facilities being planned to treat the SWM Waste such as Small Scale Bio Gas Plants, Self-supported DWCC's operated by NGO's which has resulted in not meeting the comprehensive Processing requirements.
- Landfill and health concerns: Poor waste management practices in landfills pose a significant risk to residents in nearby areas and resulted in public outreach.
- Scientific Approach for C&T and P&D: This is yet to be established hence the proper Integrated Solid Waste Management Plant as per the standards/ guidelines set by CPCB, CPHEEO manual is required to be established.
- Inadequate contract management and M&E: BBMP outsources collection and transportation activities to contractors, but the absence of clear quality benchmarks contributes to a lack of accountability and standardization in these activities. Ineffectual Monitoring and Evaluation exacerbate inefficiencies throughout the value chain.

f) Challenges in SWM Value Chain



1. *Solid Waste Collection*

The collection of waste from residential and commercial areas is a crucial aspect that marks the initial step in the Solid Waste Management (SWM) process, influencing the effectiveness of subsequent processes in the value chain. Inefficient collection processes often result in unscientific waste littering in open spaces. According to the Bengaluru SWM Bye-Laws (2020), wet and sanitary waste should be collected daily,

while dry waste should be collected two to three times a week. Presently, BBMP has delegated the collection and transportation tasks to contractors responsible for door-to-door collection activities. Despite the intended efficiency of this model, it encounters the following challenges:

- Low levels of waste segregation: Bengaluru's SWM experiences significant inefficiencies due to insufficient segregation of various waste streams. Factors contributing to low segregation levels include limited public awareness, inadequate training, mismanagement of waste by contractors, and a lack of efficient monitoring systems. In the absence of segregated waste, a substantial portion of the collected waste becomes challenging to process and ends up in landfills.

2. Lack of a data management system: Effective waste collection necessitates micro planning of expected waste quantities, collection routes, and other operational aspects. *Solid Waste Transportation*

Waste transportation plays a crucial role in maintaining the cleanliness of the city and is a key factor in determining the COST efficiency of the process. Bengaluru's Solid Waste Management (SWM) faces the following challenges in the transportation of collected waste:

- Unscientific transportation vehicles: Bengaluru's transportation infrastructure is not adequately designed to handle large volumes of waste, resulting in leachate seepage during the transportation process. This leads to unpleasant odors and unhealthy conditions for residents in areas traversed by these vehicles. Typically, these vehicles lack sufficient monitoring systems, such as a global positioning system (GPS), contributing to the mismanagement of waste.
- Lack of well-established transfer stations: Transfer stations facilitate the transfer of collected waste to larger vehicles for convenient transportation to the final destination. Without defined transfer stations, Bengaluru encounters the challenge of multiple small vehicles transporting waste to processing units, leading to unscientific disposal of waste at times and an increase in transportation COSTs.

- Lack of well-defined aggregation points for dry waste: Although Dry Waste Collection Centers (DWCCs) contribute to waste segregation at the ward level, there is no structured mechanism for collecting segregated waste from them. While high-value and recyclable waste is sold to recyclers, the absence of an aggregation point for dry waste results in inefficient management of low or no-value waste, leading to unscientific disposal.

3. *Challenges in SW Processing*

BBMP is currently grappling with significant challenges in processing waste effectively, evident from the fact that approximately 80 percent of the waste is currently being directed to landfills.

In Bengaluru, waste processing predominantly centers on the treatment of wet and dry waste. Dry waste is managed through Dry Waste Collection Centers (DWCCs) established in 119 wards, overseen by Contractors appointed by BBMP. These centers engage informal waste pickers, offering them an alternative livelihood opportunity. Presently, only 119 out of the city's 225 wards have operational DWCCs, recovering a mere 20 percent of valuables from the collected waste.

For wet waste processing, BBMP operates both centralized and decentralized facilities. The decentralized facilities include 12 Biomethanation plants, of which only 2 are currently operational, leaving 84 percent of the capacity unused. Additionally, BBMP owns seven centralized windrow composting facilities strategically located throughout the city and has partnered with a private processing facility, resulting in a combined daily capacity of 2230 MT. However, at present, Substantial fraction of the Total SW capacity remains untapped.

4. *Challenges in Waste Disposal*

As of now 70% to 80% of the waste is being disposed at the disposal site without any proper treatment and due to which there is rising concern not only land availability but also unscientific manner of waste dumping which is further leading to environment deterioration.

Conclusion

In summary, Bengaluru's waste management faces structural, operational, and value chain challenges, including hierarchical management, financial limitations, and processing inefficiencies. Issues in waste collection, transportation, and processing contribute to the inadequate management of waste, with a substantial portion ending up in landfills. The disposal of untreated waste raises concerns about land availability and environmental deterioration. Addressing these challenges necessitates a holistic approach involving structural reforms, operational improvements, and enhancements throughout the waste management value chain which is hereby proposed with a Comprehensive Integrated Solid Waste management scheme for the entire Bengaluru Urban District for a concession period for a minimum tenure of 25-30 years which will provide a suitable solutions in terms of feasible and financial viable investment towards capital COST and O&M COST.

2.3 An overview of Project Jurisdiction

The proposed study covers the area of Bangalore Urban District along with the BBMP Jurisdictions.

i. Bengaluru Urban District: The urban district covers about 1450 sq. km with a population of about 5.32 Lakhs (approx.) which covers the 86 villages majorly in five divisions i.e. Yelahanka, Byatarayanapura, Yeshwanthpur, Kengeri and Mahadevapura.

ii. Jurisdiction of the BBMP: The BBMP covers an area of about 714 sq. km with a population of 1.32 Crores (approximately) and a floating population of 9.78 Lakhs. There are about 198 wards (old) and currently 225 wards amalgamated into 30 divisions/ Assembly constituencies and these divisions are further amalgamated into 8 Zones (MP Constituencies).

3 EXISTING SYSTEM OF SOLD WASTE MANAGEMENT IN BENGALURU:

As of BBMP records the existing C&T is shown considering 5,647 TPD only. However, as per analysis and survey, it is made clear that the Bengaluru city generates approx. 8096 TPD of Solid Waste and Including the Waste Generated by the population residing within the BBMP jurisdiction (i.e. 7265 TPD), population of the Urban District of Bengaluru, other than BBMP limits (i.e. 292 TPD) and the waste Generated by the Floating population (i.e. 538 TPD).

3.0 Doorstep Collection:

The Primary Objective of BBMP is to see that citizens are provided the services of waste collection and all the discarded material are moved out for processing and disposal before 12.00 noon. The aim is to see that services are delivered early in morning and waste is segregated by generator is collected and then transported to processing facility. The objective is to remove discarded materials from inhabited places promptly to prevent the spread of disease, to reduce aesthetic results arising from putrefying organic matter, and, equally important, to dispose of the discarded materials in a manner that is environmentally acceptable

Following are the salient features of the existing Door to Door Waste Collection Services

1. BBMP is providing daily waste collection service to all the households, slums, shops and establishment. Entire collection and transportation activities has been outsourced.
2. Presently 4,600 Auto tippers are collecting waste from various streets, lanes. Roads in the city of Bengaluru.

3. All the primary vehicles i.e. auto tipper will carry the waste from ward level to the transfer station or the refuse compactor stationed at specific locations for secondary collection and transportation of waste to the decentralized facilities or the dumpsite Every 3 to 4 auto tippers are backed by one refuse compactor.

4. The auto tippers are mainly four wheelers with hopper of (750- 1000 kg) capacity. Howe ever a few of them are of bigger size. They are manned by 1 driver + 2 helper.
5. Each auto tipper covers 750 households per day which is considered as a block, Each auto tipper makes generally 2 trips a day . The average area covered by a ward is around 2 to 3 square kilmetres
6. The operation starts as from 6:30 AM to 12:30 PM / 01:00 PM. The 3 trip is dedicated for collection of Street Sweeping Waste and garbage vulnerable point their allotted ward from 12:30 AM to 2:00 PM. By 2 PM the ward is to be ensured that it is completely cleaned.
7. These auto tippers are outsourced by BBMP through PPP mode. The private partner has to deploy auto tippers and compactors. Each packages of single private players service scope encompasses door-to-door waste collection, segregation, collection, and transportation of segregated waste to the nearest transfer station / decentralized processing unit / end - processing unit (composting, dry waste collection centre, or authorized recycler). In the absence nearby decentralized plant or any other facilities, waste can be transferred to compactors and then sent to the nearest processing unit or dumping ground.

8. There are 225 wards in the city. Each ward has a different Private Player enraged by BBMP. There are 89 Private Players who are responsible for operating in all 225 wards for door step collection and transportation of waste from residential and commercial units. They are also responsible to clear the street sweeping collected heaps.
9. The Private Players engaged by BBMP is paid on the invoices submitted by them after evaluation of their services delivered.
10. The Private Players do not collect any user charge from waste generators. Neither BBMP collects any user charge.

11. Apart Self-Help Group's (SHGs) and Residential Welfare Association (RWAs) are also involved in door to door collection, segregation & decentralized composting in some of the areas.
12. They are mainly run by private players mostly under the name of NGO/ Sangha's/ societies/associations. They are approximately 180-250 such groups operating under different areas.
13. In the domain of collection and transportation, several categories of entities are involved in managing waste. For residential areas and apartments with less than 40 flats, the collection process encompasses residential premises and small shops during the first trip, while open points and street waste are addressed during the second trip. Shops and small commercial establishments also fall under the purview of same contractors. Open points at the ward level are similarly managed by these contractors.
14. Bulk generators, consisting of facilities with more than 40 flats, are also managed by 40 to 45 empanelled contractors
15. Wet waste is collected daily basis, while dry waste is collected once in two days or thrice a week.

16. The terms and conditions with respect to service deliverance and expectation from the private players.

Figure8: Wet & Dry waste Collection separately

3.1 Storage & Secondary Collection:

1. Bengaluru city is a bin less city and the bins/ Litter bins are placed only in the commercial areas. The SW collected from Door to Door is brought to a common point from where the waste is transferred to the Disposal sites through compactors & tipper Lorries
2. The collected waste need to go to the nearest dry waste / wet waste collection centre/ transfer station. If the waste is mixed and is refusal category by the dry waste/wet waste collection centre/nearest transfer station the same is being transferred to the auto tippers to refuse compactors engaged by the same private player. The refuse compactor transports the waste to nearest large decentralised processing unit or to the dumping ground.
3. The refuse compactor is of minimum 14 cu m and maximum 18 cu m. Each Refuse compactor is manned by 1 Driver and 1 Helper
4. The list of the existing auto tippers, refuse compactors, dry waste collection centre, wet waste collection centre, transfer station and processing unit and dumping grounds.
5. All the primary vehicles i.e. auto tipper will carry the waste from ward level to the transfer station or the refuse compactor stationed at specific locations for secondary collection and transportation of waste to the decentralized facilities or the dumpsite.

Fig9:Compactors for waste collection

6. Compactors typically undertake a minimum of 1 trip, covering an average of 50 kilometres (around trip), with some refuse compactors making up to two trips per day as needed.
7. There are 4,600 three-wheeler/ auto tippers and 600 Refuse compactors are deployed for waste collection and transportation.
8. In residential areas or houses, wet waste is collected at the doorstep on a daily basis, while dry waste is collected twice a week using a dedicated vehicle.
9. In slum areas, waste collection vehicles are stationed at a specific location, where waste generators hand over their waste directly to the vehicle, without the need for helpers using wheelbarrows or 60-liter bins. Resource deployment for this operation consists of one driver and one helper assigned to each auto tipper.

3.2 Dry Waste Collection Centres (DWCC)

Bengaluru has a unique waste storage and collection system. The Dry Waste which is generally collected every alternate day by the same auto tippers from households every alternate day is stored and collected at Dry Waste Collection Centres (DWCCs) constructed on Government land. Recycling of waste is also possible by setting up purchase / processing centres for dry waste, like plastics, paper, etc. About 119 Dry Waste Collection Centres (DWCC) have been established BBMP. It is one of its kinds and first time in a metro a DWCC concept is established. These DWCC called *Kartavya* – meaning duty that will remind the public of their duty towards recycling the waste they have created. This will be in their own neighbourhood and over a period of time the *Kartavya* centers will become part of the local community fabric

Fig10: -Dry Waste Collection Centers DWCC's

The aim of Dry Waste Collection Centers (DWCC's) is to keep as much waste out of the landfills/waste dumps as possible and to help make waste useful and profitable. DWCC's run by various agencies in Bengaluru in coordination with the BBMP is decentralized bulk sorting and processing facilities. About 185 DWCC's were planned and 146 nos. have been established and 119 nos. are functional currently. DWCCs are set up on municipal/government/private lands and various NGOs, waste pickers, and contractors; self-help groups have been involved for effective functioning. The dry waste generated in the wards is collected and further segregated and sent for recycling from these recycling centres. Receiving in bulk provides these informal sector workers with more significant returns and creates more jobs.

Dry waste materials like batteries, tin cans, plastic-coated milk cartons, nylon, cigarette butts, and leather all take varying lengths of time to degrade: not less than 10 years. Hence, the best way to dispose of these dry waste items is to reuse/recycle them. Nearly 55%-70% of all the dry waste thrown away can be safely disposed of this way

DWCCs is operated by various Agencies / NGO's in coordination with the BBMP is for bulk sorting and forwarding the Dry Waste to authorized recyclers.

Fig11Segregation at Dry Waste Collection Centers DWCC's

The DWCCs are categorized based on their size and capacity as follows:

(a) Small (Up to 1.0 Tons Per Day) – These have a floor area ranging from 80 to 100 square meters.
(b) Medium (1.0 to 2.5 Tons Per Day) – These occupy a floor area between 150 to 200 square meters.
(c) Large (More than 2.5 Tons Per Day) – These have a substantial floor area exceeding 300 square meters.

Prominently, BBMP has partnered with 2 to 3 non-governmental organizations (NGOs) to operate these DWCCs as part of their Corporate Social Responsibility (CSR) initiatives or Circular Economic programs, with organizations such as ITC and GAIL India participation.

The Dry Waste Collection Operators purchase waste materials from Waste Collectors, Rag Pickers, and Bulk Waste Collectors based on a daily price list.

The DWCCs are equipped with multi-story buildings, compound walls, gates, and essential facilities like generators, weighbridges, and specific partitions to support their operations. Also, there are 2 automatic segregation units/machine in slum area of 10 TPH for segregation of dry waste and recovery of material. These are

established by BBMP at acCOST of Rs 3.5 crores each. These plants are operated and maintained by private players.

The Example of one of such facility (DWCC) can be seen in the table mentioned below:

Table 4: Dry Waste collection Centers

SL NO.	PARTICULARS	DETAILS
1	Location	Ejipura
2	Year of Commencement	2017
3	Operator	BBMP
4	Zones Covered	Ward no 147 and 148
5	Area of Plant (in acres)	2.5 approx.
6	Designed Capacity	2.5 TPD
7	Current Operating Capacity	1.5 TPD
8	Facilities Available	i. G + 1 Buildings with Compound Walls / Gate etc. ii. Diesel Generator iii. Small Scale Weighbridge iv. Specific Partitions.
9	No of workers for operating in the plant	6 to 8 Members (Approx.)
10	Supervision In charge	BBMP Ward Supervisor
11	Recyclable Sale rate	Different rates for different recyclable fractions which is decided by BBMP on regular basis.

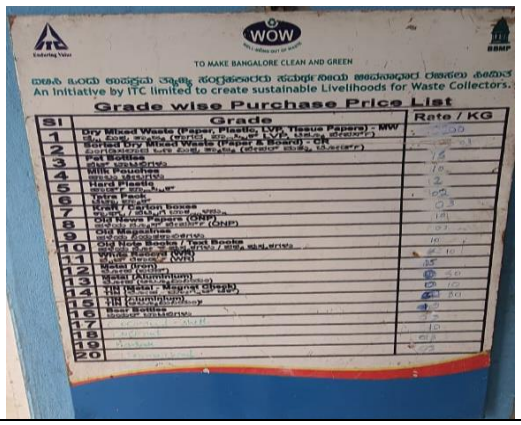

WOW
TO MAKE BANGALORE CLEAN AND GREEN
An initiative by ITC limited to create sustainable Livelihoods for Waste Collectors.
Grade wise Purchase Price List
Sl
Grade
Rate / KG

Fig12: Dry Waste Collection Centre (Waste Details Board)

There dry waste collection centres are approximately 10000-15000 sq ft in area. At Ejipura Location This DWCC facility also serves as Waste Transfer points.

Note: The above existing Dry Waste Collection Centre is similar or for indication of all the other 119 DWCC established by the BBMP.

Although the DWCC's has been established to see that segregated dry waste goes for recycling and utilisation and contribute towards circular economy but in reality, more than 60 – 70% of collected dry waste goes to the Dumpsite. DWCCs are set up on municipal / Government / private lands and various NGO's, have been roped in for effective functioning.

A separate MOU has been entered into by the BBMP with the operator. In addition, corporate companies are being encouraged to come forward to provide gap funding required under the EPR (Extended Producer Responsibility) of such centres also ensure that the recyclable material is sold through properly created channels to ensure that the recycled goods are not misused.

The DWCC also pays the Pourakarmikas /Public/Waste-picker or any individual who bring the waste to the centres as notified by BBMP from time to time. This encourages the public to segregate the waste at source. Also, a part of the dry waste centres is earmarked to store e-waste collected from the households.

3.3 Bulk Waste Generator Waste Collection & Transportation:

In terms of waste management, Bulk Waste Generators, defined by BBMP as those producing over 100 kg/day or occupying more than 5,000 sq. m, a group of houses / flats of more than 40 Nos in a society. The city's estimated waste generation ranges between 1,000 to 1,200 Tons Per Day (TPD), and these generators are serviced by empanelled contractors responsible for collection under a user charge system.

Following are the major features of the existing solid waste collection system from Bulk Waste Generators in Bengaluru City.

1. The BBMP has notified Bulk Generators to segregate waste into different categories and manage their waste either in-situ or to utilize the services of BBMP Empanelled Service Providers.
2. A separate system has been put in place to collect waste from large waste producers like hotels, restaurants, marriage halls, markets, offices, etc. BWG waste collectors are collecting thse waste.
3. In this regard BBMP is facilitating the Bulk Generators with options of authorized service providers to engage for collection, transportation and processing of SW. SWM Service Provider Empanelment program aims to create a platform for solid waste service providers to enlist themselves. It will also ensure that Bulk Generators can meet the requirement of segregated waste processing in a responsible decentralized way.
4. Empanelment of service providers for various categories of SW has been taken up and the first list has been published empanelling 60 service providers. The empanelment process is continued.
5. The Bulk Waste Generators are directed to store the waste in their premises in segregated manner.
6. All resources including manpower, equipment, bins, bags and vehicles by the empaneled agencies are engaged by them.
7. The waste is collected in larger vehicles which are mainly in of tata 407 type or equivalent. The trips are based on type of waste and commercialization of the area.
8. BBMP does not make any payment to the emplaned agencies. Neither BBMP collects any user charge from BWG or through the engaged agencies.
9. The emplaned agencies collect monthly service charge directly collected by the Bulk Waste Collectors.
10. Bulk Waste Generator - Commercial Units (Mini: Rs 500 Per Month and Maximum – As per the Area of Premises).
11. Bulk Waste Generators – Residential / Flats / Villa (Rs 150 to Rs 200 Per Month).
12. The collected waste is transported the waste to the processing unit/ dumping ground as deemed after taking away all the recoverable material and resources. The collected waste is transported directly to private recycling or processing units such as Material Recovery facilities or Biomethanation plants established by the Carbon Masters, MSGP Plant.

3.4 Sanitary Waste Management System

The Sanitary waste comes to around 1% of the total Generated SW i.e. 60 Tons Per Day (TPD) approx. As of now there is no such facility to handle and manage Sanitary waste in

a scientific manner. Thus, through this project of establishing an ISWM Plant will have the Incineration Facility for these Sanitary waste.

The Sanitary waste is collected from apartment, women hostel and hospitals wards. BBMP is in the process of transhipment of 3 sanitary waste disposal centre in the City of two 10 TPH each and one 5 TPH at three different locations. The COST is Rs 10 cr. for 10 TPH and Rs 5 Cr for 5 TPH. Plants have all clearance by Technical clearance by KSPCB and are likely to be operated soon. BBMP plans to have over operation and maintenance of these plants to private players.

3.5 Animal Carcass and Animal Waste

At present, city generates around 50 Tons Per Day (TPD) in the normal days and 85 Tons Per Day (TPD) of Animal waste in the Peak days like festivals etc. As of now, there is only 1 plant of 4 TPD Capacity each to handle the animal carcass and the animal waste. Thus, it is proposed to have 20 numbers of such capacity of plant to handle the Animal Carcass and the Animal waste. (Refer Annexure-AW)

3.6 Transfer Station Management and Secondary Collection and Transportation:

Transportation of waste from collection centres to the landfill site is another crucial step in waste management. At present, waste transportation is through auto tippers and in some cases through push carts and rickshaws. to primary collection centres. From there, compactors collect the solid waste and transport it to waste processing facility (Decentralized Wet waste management facility) and the disposal sites/dumping ground. In the first scenario, Auto Tippers deposit waste into the Refuse Compactors located at the Transfer Station or designated open points for loading. These operations are managed by Private Players.

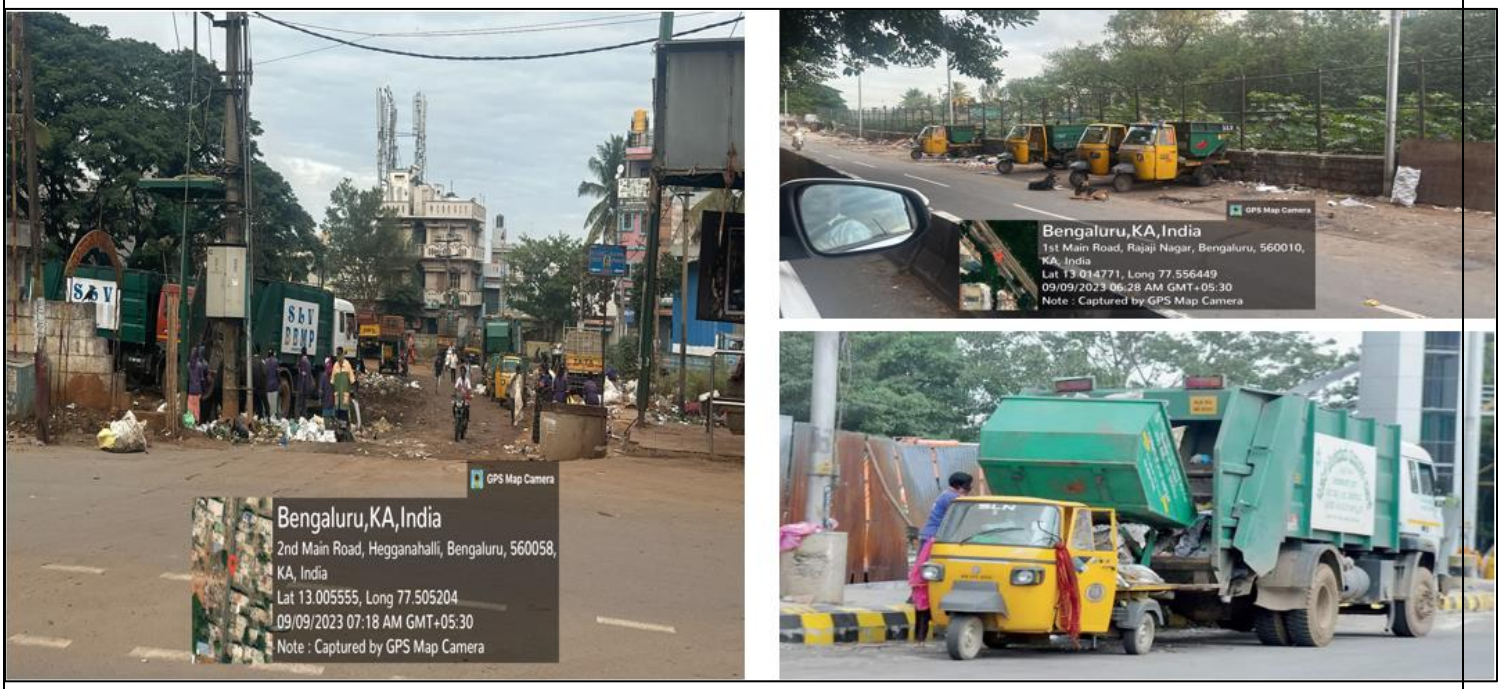

GPS Map Camera
Bengaluru,KA,India
2nd Main Road, Hegganahalli, Bengaluru, 560058, KA, India
Lat 13.005555, Long 77.505204
09/09/2023 07:18 AM GMT+05:30
Note : Captured by GPS Map Camera
GPS Map Camera
Bengaluru,KA,India
1st Main Road, Rajaji Nagar, Bengaluru, 560010, KA, India
Lat 13.014771, Long 77.556449
09/09/2023 06:28 AM GMT+05:30
Note : Captured by GPS Map Camera

Figure 13: Waste Collection Vehicles (Door to Door)

Figure 14; Weighbridge for Inward vehicle weighment and Vehicle parking

There are also mini transfer stations which acts as waste collection centres. There are 24 mini transfer stations (25 Tons capacity each). These Mini Transfer Stations were constructed in 2020 and are managed by BBMP through an Engineering, Procurement, and Construction (EPC) and Operations & Maintenance (O&M) contract

Furthermore, there is a 150 TPD- 300 TPD Transfer Station located at a single site, also established and one is in final stage of completion at another site as part of the EPC and O&M Contract, but constructed in 2023. Again, BBMP is responsible for its management. It is planned for establishment of two more of such 150 TPD- 300 TPD Transfer Station.

Lastly, the transportation of waste to Decentralized Plants and the dumpsite is carried out by C&T Contractors, who were appointed by BBMP in 2019. And there approximately 580 to 600 nos. of 14 Cubic metres refuse compactors plying for Secondary Transportation from ward to designed decentralized plants or landfills or dumpsite covering a distance of 60 kilometres per day.

This entails one trip per day, covering a distance of 60 kilometres (to and fro) either to an existing processing plant or to the designated dumpsite.

Figure 15: Unloading waste from tipper to Heavy Compactor Vehicle

3.7 Road Sweeping:

1. The sweeping is performed both manually & mechanically. In some of the highly commercial activity areas sweeping is done during night.
2. BSWMPL through BBMP undertake Street Sweeping. The street sweeping of the roads maintained by BBMP is mainly done by manual method.
3. Approximately BBMP has 10,200 Kms of roads of various types in the city of Bengaluru.
4. The street sweeping is done by Pourakarmikas of the Bruhat Bengaluru Mahanagara Palike. Nearly 18,500 Pourakarmikas are deployed for manual sweeping of the roads.
5. A few stretches of roads are also swept by Mechanical Road Sweeping Machines. They are used to sweep the Main Roads and bus routes of Bengaluru.
6. The swept material is collected in heaps in various wards. the collected heaps are transferred by Pourakarmikas / auto tippers to the nearest disposition centre. The disposition centre is generally the nearest auto tippers / waste collection centres. The Pourakarmikas and swept waste collection system is working in synchronisation to ensure that no vulnerable points and eye sore are created in the area.
7. BBMP (as per the GO UDD 126 TMS 2016 dated 7th August 2017), pays separately for the services of sweeping undertaken. These includes payment to Pourakarmikas and other associated infrastructure equipment.
8. There is no private player engaged in manual sweeping work under taken by BBMP.

3.8 EXISTING SOLID WASTE PROCESSING & DISPOSAL SYSTEM

Bengaluru generated approximately 8,096 TPD of SW each day. Over a period of time in last two-decade BBMP has practised a mix of centralised and decentralised processing and disposal of waste. The major focus has been resources recovery with more effort on decentralised processing of waste. BSWMPL through BBMP has set up number of dry waste

collection centres (119) and a number of wet processing units of various sizes (8 Facilities). The effort has been to see that waste does not get transported to larger distance and it gets treated in-situ.

While effort to treat the waste has been enormous the outcomes has not been to the level with increasing growth of the city and burgeoning problem of waste generation. This has led to no large scale of any appropriate scientific treatment techniques for waste generated by the corporation. This has led to the filling of the quarries and there by dumping of waste.

The solid waste, generated from hotels, restaurants, Kalyana mandapas, markets, etc., is being directly collected and transported to the various processing units / treatment/disposal facilities.

As on date Bengaluru has multiple waste processing units where waste is processed mostly through Composting and Biomethanation Process.

Figure 16: Biomethanation Plant - 2

Figure 17: Biomethanation Plant - 1

To process wet waste, 5-ton capacity Biomethanation plants are being established at 16 locations, out of which 4 have been made functional. The biogas generated from these plants is being utilized to light the street lights in that locality

3.9 Processing Plants (Decentralized Facility for Wet Waste)

Sl. No.	Name/location of the plant	Land area (in acres)	Design capacity in (tpd)	Existing capacity (wet waste)	Average waste processing	Ownership of the plant	Components available in plant
1	Chikkangamangala	25	500	350	245	BBMP	Compost
2	Doddabidarakallu	10	200	150	79	BBMP	
3	KCDC	10	500	350	150	BBMP	

4	Kanahalli	22	150	350	350	BBMP, Private (Sateram)	
5	Lingadheeranalli	10	500	120	60	BBMP	
6	Seegehalli	8	200	150	100	BBMP	
7	Subbarayanapalya	10	200	150	16	BBMP	
8	Koramangala	2	5+8(augmented from 5 to 8)	5+5	13	BBMP, PRIVATE	Biomethantion
Total			2263	1630	1013		
9	MSGP	75	-	750	700	Private MSGP	It is processing waste of BWG's

Table 5: Processing Plants Centres

There are 8 Nos of Wet Waste / Processing facilities established by BBMP for 7 units through EPC contracts for about Rs. 450 crores and one by private (MSGP).

The projects were mainly designed for treatment process of wet waste through anaerobic composting and bio methanation. As on date they are able to treat 1450 TPD of the waste. The untreated waste is transported to dumping ground. BBMP have enraged their own staff or engaged through contract for the operation and maintenance of these plants.

. One notable feature of the all the processing and treatment plants is that plants lacks infrastructure from treatment of leachate in most of the case there by likelihood of leached moving out of the plant premises without treatment.

Table6: Existing Wet waste facilities

SL. NO.	NAME/LOCATION OF THE PLANT	LAND AREA (IN ACRES)	DESIGN CAPACITY IN TPD	EXISTING CAPACITY (WET WASTE)	AVERAGE WASTE RECEIPT	OWNERSHIP OF THE PLANT	COMPONENTS AVAILABLE IN PLANT
1	Kannahali	22	150	350	283	PRIVATE	compost
2	MSGP	75	-	750	700	PRIVATE	Compost, RDF, LTP and Sanitary landfill

A 40 TPD unit to convert the organic waste into bio fuel through palletisation at Ward No 94, adjacent to Freedom Park, Gandhinagar, West zone by M/s CIPL Resurge Private Limited (CRPL) is commissioned from Dec 2014.

Figure 18: Wet Waste Process Facility

3.10 BBMP's Pipeline Projects for Waste to Energy

There are 6 proposals under discussion and different stages of planning and implementation. All the proposal is based on dry waste supply by BBMP at the door step at its own COST of

BBMP. All are without tipping fee. All are standalone and without any Processing and Disposal Component. The Rejects disposal to be in the scope of BBMP. The Rejects disposal is on negative Tipping fee @ Rs 230 per ton. No plant has seen the light of the day and even started except for one at KPCL limited.

The plant of KPCL is JV between BBMP and Hitachi Zosan (HZ). Plant is estimated to be established at Rs 260 cr. With Rs 130 cr. by BBMP and Rs 130 cr. By HZ. 11.5 MW is the expected power to be generated from 600 TPD of dry waste. Rs 7.08 is the PPA signed. The Civil works is in completion stage. Civil works done by SGEC Noida. Plant is expected to be put to operation soon. O & M is given as part of the contract for certain period (3 years). After that KCPL has to run the plant.

Following are the details of the WTE Proposed plants

S.No	Name of the Company	MT assured	Power Generation	Location	Area acres)	Agreement date	Status
1.	M/S Sateram	1000	14.5 MW	Kannahalli	25	01.06.2020	Compost Plant & LTO under operation, NO PPA
2.	M/s Indium	100	2 MW	Doddabidarikallu	2.5	14.05.2020	Revised proposal of 6 MW sent to government for reconsideration
3.	M/s Firm Green	1000	CNG, Bio Fertilizer, RDF LANDFILL	Mavallipura	13	04.12.2020	The company offered a 2% royalty on net profit. PBG is yet to be submitted
4.	M/s NEG	600	12 MW	Mavallipura	20	28.03.2022	PPA yet to be signed
5.	M/s KPCL	600 RDF	11.5 MW	Bidadi	10	01.01.2019	Work under implementation
6.	M/s GAIL	300 MT	BIO CNG	Mandur	18	30.01.2022	No progress
	Total	3000 MT + 600 RDF					

3.11 Existing Dumping Ground

3.7.1 Open Disposal / Dumpsite Management:

As on date there are 4 major lands where waste dumping is happening . Two of them are quarries. One at Belahalli and the other at Bingipura. There are other dumping grounds viz:

one at Mavallipura which is under closure -140 acres and the other at Mandur which is at 135 acres There is no scientific disposal through engineered landfill authorised by KSPCB.

Bengaluru grapples with landfill management challenges stemming from a surge in waste production and limited waste processing capacity, resulting in merely 30 to 35% of waste being effectively processed. The temporary closure of established landfills like Mandur and Mavallipura is attributed to environmental concerns.

Figure19 :Existing Dumping Ground

Approximate 3000 TPD is being dumped as on date. Last August 2023 onwards waste dumping has been 3200-3500 TPD approximately .

To maintain the area around dumping ground Rs 60 cr. per year is expenses on Dumping Ground Management by BBMP. Apart Rs 25-Rs 30 crores is the expenses on the Area

development works to be carried in the nearby villagers of quarries in form of roads, drain green belt etc. This includes lining and other leachate management COST. The O & M of the landfill is separate. The Dumping ground in the City is at table 5.

The Banahalli dumping ground is the active dumping ground which is in open quarry an is receiving most of the waste as on ate. The Banahalli Dumpsite is an open quarry with two parcels of land spread to the extent of 35 acres + 15 acres situated in the Yelahanka Zone, which receives 3,600 tons of mixed on a daily basis. The entire waste received at this dumpsite is not been processed nor treated, but openly dumped into the pits / open area. The open pits are lined with HDPE liners to avoid ground water percolation. Once the quarries are filed BBMP intends to close the dump ground by scientific capping procedure to restrict the contamination soil, water and air. But the notably absence of proper leachate management and gas extraction systems, leading to detrimental consequences affecting nearby communities.

<table>
<tr><th>SL NO.</th><th>PARTICULARS</th><th colspan="4">DETAILS</th></tr>
<tr><td>1</td><td>Location</td><td colspan="4">Yelahanka</td></tr>
<tr><td>2</td><td>Coordinates</td><td colspan="4">Latitude: 13.11022
Longitude:77.64992</td></tr>
<tr><td>3</td><td>Year of Commencement</td><td colspan="4">2017</td></tr>
<tr><td>4</td><td>Operator</td><td colspan="4">Land capping is done by Private Contractor (Sudarshan Raju)</td></tr>
<tr><td>5</td><td>Zones Covered</td><td colspan="4">From all the parts of Bangalore</td></tr>
<tr><td>6</td><td>Area of Site</td><td colspan="4">54 acres</td></tr>
<tr><td>7</td><td>Used land</td><td colspan="4">39 acres</td></tr>
<tr><td>8</td><td>Available land</td><td colspan="4">15 acres</td></tr>
<tr><td rowspan="8">9</td><td rowspan="8">Existing Facilities</td><td></td><td>NAME OF FACILITY</td><td>YES / NO</td><td>REMARKS</td></tr>
<tr><td></td><td>Compound wall</td><td>No</td><td></td></tr>
<tr><td></td><td>Security room</td><td>Yes</td><td>For 6 Marshals</td></tr>
<tr><td></td><td>Weighing Bridge</td><td>Yes</td><td></td></tr>
<tr><td></td><td>LTP</td><td>Yes</td><td></td></tr>
<tr><td></td><td>Workshop</td><td>No</td><td></td></tr>
<tr><td></td><td>Green belt</td><td>No</td><td></td></tr>
<tr><td colspan="4">Note: Waste is been dumpsite in between 2 existing quaries.</td></tr>
<tr><td>10</td><td>No of workers for operatingthe plant</td><td colspan="4">No clarity</td></tr>
<tr><td>11</td><td>Supervision In charge</td><td colspan="4">BBMP</td></tr>
</table>

12	Satellite Imagery	

The present condition at Banahalli dumping ground is that phase # 1 : Dumpsite is Covered with Clay (Capping process in progress) and phase # 2 : Liners Installed and Mixed Waste is dumped without any process. The site is having noncompliance in all other aspects. there are constant odors and methane gas is open to environment

Figure 20: Present condition at Banahalli dumping ground

Figure 21: Present condition at Bingipura dumping ground

Note: *In addition to the aforementioned, dumping is also taking place at the Bingipura site, where an estimated 1000 Tons Per Day (TPD) of waste is being deposited without undergoing any processing.*

3.12 Summary of the above Existing Facilities:

The summary of the existing scenario within BBMP limits is as follows

The existing scenario:

1. Wards: 198
2. Population:1.32 cr. (excluding Floating Population)
3. House Holds (residential including slums and but excluding Bulk waste generators): 27,94,724
4. Commercial establishments other that bulk waste generators:3,07,774
5. Total House Holds: 31,02,498
6. Waste being transported in the existing mechanism
    a. Domestic: 4000 TPD
    b. Small Commercial other than bulk waste Generators: 1530 TPD
    c. Total: 5530 TPD

7. Total Auto Tippers with 750 Kgs to- 1000 Kgs for primary collection:

Auto tippers (1 per block; daily collection)	Extra AUTO for markets / leaf litter / slum / high profile areas	Autos required (1 per 1750 units; bi-weekly collection)	Extra autos for commercial Night Collection (Non-Bulk Collection)	TOTAL
4084	41	596	4	4725

8. Compactor

WET Waste Compactor (10 Tonnes)	Reject + Mixed Waste Compactor (10 Tonnes)	TOTAL COMPACTORS (10 Tonnes)
319	212	531

9. Existing processing quantities and its processing facilities

    a. **Compost:** 2300TPD (designed) 1630 TPD (on an average)
    b. **RDF segregation:** 119 DWCCs generating 120 TPD

c. **Bio Methanation:** 5 TPD capacity of 7 under upgradation and 4 of new plants of 5 TPD under execution stage
d. **WtE:** 600TPD (RDF) incineration to generate electricity is in the final stage of the execution

10. Existing Dumpsites and its capacities

S No.	Locations	Area	Status
1.	Mavallipura	138 acres	
2.	Kannur	10 acres	
3.	Mandur	135 acres	No Processing > No Landfill, WTE is under planning
4.	Bidadi	75 acres	Compost, RDF and SLF operational by Private Party
5.	Ullahalli quarries		Dumping going
6.	Kannuru quarries		Dumping going on
7.	mittangahalli		Dumping Going on
8.	doddabidarakallu		Dumping going on
9.	Chikkanamngala		310 TPD No landfill Now
10.	Kcdc at hsr layout		110 TPD No landfill Now
11.	Subarayanpalya		Closed
12.	Seegahalli		Closed
13.	Ligadhirnahalli		Closed

11.Compost processing plants details

Sl. No.	Name/location of the plant	Land area (in acres)	Design capacity ir (tpd)	Existing capacity (wet waste)	Average waste processing	Ownershipof the plant	Components available in plant
1	Chikkangamangala	25	500	350	245	BBMP	Compost
2	Doddabidarakallu	10	200	150	79	BBMP	
3	KCDC	10	500	350	150	BBMP	
4	Kanahalli	22	150	350	350	BBMP, Private (Sateram)	
5	Lingadheeranalli	10	500	120	60	BBMP	
6	Seegehalli	8	200	150	100	BBMP	
7	Subbarayanapalya	10	200	150	16	BBMP	
8	Koramangala	2	5+8(augmented from 5 to 8)	5+5	13	BBMP, PRIVATE	Biomethantion
Total			2263	1630	1013		
9	MSGP	75	-	750	700	Private MSGP	It is processing waste of BWG's

4 JURISDICTION OF PROPOSED PROJECT

4.0 Project Area Information:

For the proposed Collection & Transportation work, hereby the project considers only 400gm/day/capita of Solid waste generation. This calculation excludes Solid waste generated by Bulk Waste Generators (BWG)'s. The BWG's Solid waste shall be separately handled by the Authority and shall not be part of Scope of work under C&T for this project. However, the same may take into purview of the concessionaires after the decision on the same by Government. In such cases the BWG waste need to be transported by the same concessionaire of their jurisdictional area as per the mutual terms and conditions to be executed in such cases. Presently thus the parameter and information set in this chapter is considered excluding Solid waste generated by BWG for C&T work and including BWG's waste but excluding existing commitments for P&D work.

The Proposal is envisaged to take up the Bengaluru urban district and BBMP jurisdiction and accordingly a comprehensive proposal is required to establish to arrive the defined objectives to appoint:

A. Collection & Transportation of the Primary and Secondary Transportation to the proposed/existing processing plants. This objective shall be executed either after the existing contracts get expires or depends upon the performance of the existing C&T contracts.

B. Establishment of Integrated Processing Facilities at various locations to treat the Solid Waste (SWM) as per Solid Waste Management Rules (SW), 2016.

The project spans a total area of 2,160square kilometres and has a population of around 14.72 million residents. The average daily floating population in the city is approximately 1 million, the project area also includes the Urban Districts of Bangalore, and the details of the project area are provided in the table below.

INFORMATION	DATA
Project Area	
Total Area (Km^2)	2160 sq. km
Population	
Population within BBMP Limits (Lakhs)	132
Urban District other than BBMP (Lakhs)	5.32

Floating Population (Lakhs)	9.78
Total number of Households (lakhs)	32.83
No. of Zones	8
Divisions (Assembly constituency)	30
No. of Wards in BBMP area	225 (198 wards – old)

Source: Secondary Data / BBMP SWM Cell

According to the data provided by the BBMP, the waste generation information reveals that the Bengaluru City Corporation Limits spans 714 square kilometres, with 225 wards, a population of 1.32 crores. Approximately 31.45 lakh households are there within City Limits.

Additionally, the city experiences a daily influx of around 10 Lakhs floating population.

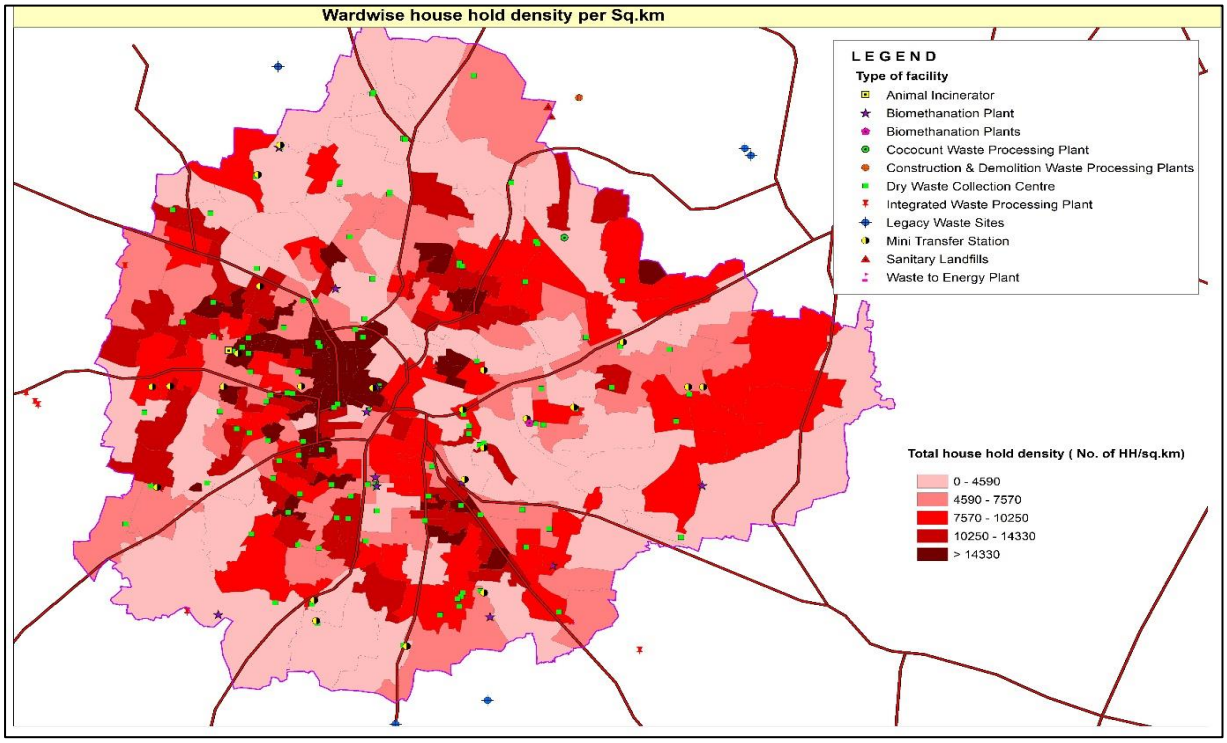


Figure : BBMP map with existing SWM Facilities

4.1 Waste Generation & Projection:

Bengaluru, with a population of approximately 147 Lakhs people in the base year of 2023, generates an estimated 5,861 metric tons per day (MT/day) excluding bulk waste generator and waste from street sweeping of solid waste (. This equates to an average of 0.4 kg/day/per capita for the population within the jurisdiction of BBMP and for the floating population, while the same stands at 0.35 kg/day/capita for the population residing in the Bengaluru Urban District (other than BBMP). The waste projections (excluding the Bulk waste) for future years are based on population estimates, and the data is outlined as in the table below.

Table7: Waste Generation and Projection

Jurisdiction	Year	2011	2018	2023	2025	2031	2041
BBMP	population	8443675	10962585	13209907	14232935	17802401	25849498
	per capita @ 400 Grams	3377	4385	5284	5693	7121	10340
Urban District		339887	441282	531744	572925	716608	896325
	Par capita waste generation @350 grams	119	154	186	2005	251	314
Floating population		519000	673828	978413	1054186	1223789	1530702
	Par capita waste generation @400 grams	208	270	391	422	490	612
1	total Population of BBMP+ UD+ Floating population						14720064
2	total SW waste of BBMMP+ UD+ Floating population in TPD						5861 TPD
3	Street sweeping waste derived based DPR for the GVP by Sky group for year 2008 @ 395TPD						670 TPD
4	Total Waste generated						6,581 TPD

These projections provide valuable insights into the anticipated growth of waste generation in Bengaluru, enabling proactive planning and management strategies to address the increasing demands on the solid waste management system.

However, the quantity pertaining to the bulk waste is not included in C&T. But it is mandatory for the concessionaire to treat the bulk waste being generated in the city. It is considered as concessionaire's need to collect and process the bulk waste or a mutual agreement between the bulk waste generators and concessionaire shall exist to collect and process the bulk waste being generated at their own mechanism.

The per capita waste generation has been taken @ 400 Grams within BBMP & @350 grams outside BBMP, Number of House Holds per auto tipper has been taken 1250 HH within BBMP Limits and outside the BBMP limits 750 HH one Auto tipper has been considered and accordingly the assessment has been done.

Table 8: Package wise Collection & Transportation of vehicles requirement

C&T	Population	Tonnage (TPD)	Divisions/ Transfer Stations	No of Auto Tippers	Containers	Hook Loaders
Package 1	2751567	1232	6	607	109	40
Package 2	4238181	1899	9	946	168	62

Package 3	3423111	1528	6	730	135	50
Package 4	4307205	1922	9	909	170	63
	14720064	**6581**	**30**	**3192**	**582**	**215**

4.2 For Processing & Disposal :

It is mandatory for the concessionaire to treat the bulk waste being generated in the city. It is considered as concessionaire's need to collect and process the bulk waste or a mutual agreement between the bulk waste generators and concessionaire shall exist to collect and process the bulk waste being generated at their own mechanism.

The per capita waste has been taken @ 550 Grams for processing of waste and accordingly the assessment has been done.

Table 9: Estimated quantities of waste for processing year wise

Jurisdiction	Year	2011	2018	2023	2025	2031	2041
BBMP	population	**8443675**	**10962585**	**13209907**	**14232935**	**17802401**	**25849498**
	per capita @ 550 Grams	**3377**	**4385**	**7265**	**5693**	**7121**	**10340**
Urban District (UD)		**339887**	**441282**	**531744**	**572925**	**716608**	**896325**
	Per capita waste generation @550 grams	**119**	**154**	**292**	**2005**	**251**	**314**
Floating population		**519000**	**673828**	**978413**	**1054186**	**1223789**	**1530702**
	Par capita waste generation @550 grams	**208**	**270**	**538**	**422**	**490**	**612**
1	total Population of BBMP+BUD+ Floating population						**14720064**
2	total MSW waste of BBMP+ BUD+ Floating population						**8096**

The concessionaire is responsible to make the following facilities to process the waste as per the SWM rules 2016 with following facilities based on the availability/ suitability of materials available for the processing at corresponding packages.

1. Bio methanation Plants
2. WTE Plants
3. RDF processing facility
4. Animal Rendering and Animal Carcass incineration
5. Sani waste incineration unit

Table 10: Quantity Distribution of waste generation and waste processing

QUANTITY DISTRIBUTION				
A	**Total population**	**14720064**	**U.O.M**	**Percentage**
	Per capita (including bulk waste)	550	grams	
B	Total Quantity per day excluding road sweeping waste	8096	TPD	
C	**Assessment of quantities for various processes**			
1	Sani waste	81	TPD	1%
2	Animal Waste from shops (Meat waste)	81	TPD	1%
3	Animal Carcass	10	TPD	
4	Domestic Hazard waste	81	TPD	1%
6	Stones	81	TPD	1%
7	Silt & Inerts	162	TPD	2%
8	Debris	81	TPD	1%
D	**Balance Qty available for processing**	**7519**		
1	Derived Dry Waste after discounting quantities Vide C	3481	TPD	43%
2	Derived Wet waste after discounting quantities Vide C	4048	TPD	50%
E	**Assessed Processing Quantities**			
1	5% Leachate (co1nsidered for Bio methanation)	405	TPD	5%
F	**Balance Quantities**			
1	Dry waste	3481	TPD	
2	Wet waste	3643	TPD	
G	**Existing commitments**			
1	MSGP (Wet waste)	900	TPD	
2	Bio Methanation plants (wet waste)	105	TPD	
3	GAIL (wet waste)	300	TPD	
4	Coconut (dry waste)	313	TPD	9%
5	Recyclables (dry waste)	696	TPD	20%
6	KPCL (Dry waste)	600	TPD	
7	Inerts from RDF	104	TPD	3%
H	**Balance Qty available for processing under revenue generation model**			
1	For Wet waste	2338	TPD	
2	For Dry waste	1767	TPD	
I	**Street sweeping waste**	**670**	**TPD**	
1	Organic fraction of Street sweeping waste	101	TPD	15%
2	Silt for Landfill (Inerts from Street sweeping)	570	TPD	85%
J	**Inerts from Bio Methanation**	142	TPD	5%
K	**Existing Animal waste Plant**	8	TPD	
L	**Existing Sani waste plant**	25	TPD	

Table 11: Estimated quantities in various process (indicative processes)

Sl. No	Name of Process	Quantities (TPD)
1	Landfill (C6+C7+C8+G7+I2+J)	1140
2	Bio Methanation(E1+H1+I1)	2844
3	WTE(H2)	1767
4	Animal Rendering(C2-K)	73
5	Animal Carcass(C3)	10
6	Sani waste(C1-L)	56
7	Domestic Hazardous(C4)	81
8	Saleable Recyclables(G5)	696
	Total	**6667**

This considered with respect to C&T and P&D Works under this project

4.3 Waste Characterization

Information on the nature of wastes, its composition, physical and chemical characteristics and the quantities generated are basic requirements for conceptualizing & designing solid waste management plans. As urbanization has grown, along with shifts in dietary choices and lifestyles, the volume of Municipal Solid Waste has increased substantially, leading to noticeable fluctuations in waste composition. The changes in the composition of SW should form essential criteria for any waste management system. Hence, the data available on the composition of the waste from different sources over the years have been collected and analysed. The constituents of an MSW may be classified as:

Biodegradable: Organic materials, which can be degraded by biological agents, e.g. microbes are known as biodegradable. Examples are food material, fruit and vegetable waste, garden waste (plant waste) etc.

Recyclables: Plastic, metal etc.

Combustibles: Relatively dry material having a high calorific value, such as cardboard, etc. are known as combustibles.

Domestic hazardous waste: means discarded paint drums, pesticide cans, CFL bulbs, tube lights, expired medicines, broken mercury thermometers, used batteries, used needles and syringes and contaminated gauge, etc., generated at the household level.

Inerts: means waste which are not biodegradable, recyclable or combustible street sweeping or dust and silt removed from the surface drains.

Waste Characterization Report is made as a detailed assessment based on the following: -

Waste characterization Report by BBMP

Waste Characterization Report by Sky Group in DPR for GVPs

4.4 BBMP Reports

The data presented in was statistically analysed to get the variations of a different type of waste in rapidly growing cities like Bangalore (figures in percentage).

Year	Biodegradable	Paper/ leather/ cardboard	Rubber/ debris	Glass	Plastic	Metals	Others
2013	61	9	4	1	7	1	16
2017	59	12	5	3	12	1	8

Source: BBMP

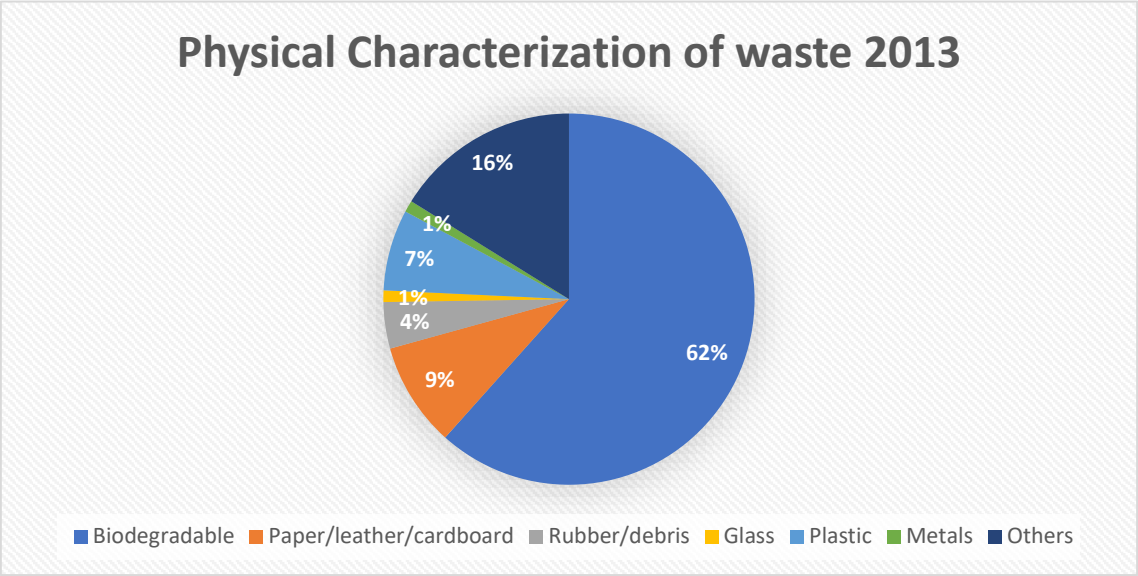


Figure : Physical Characterization of waste 2013 (For Reference)

The graph above represents the results of a waste characterization study for the year 2013, sourced from Bruhat Bengaluru Mahanagara Palike (BBMP). This study involves the physical characterization of different types of waste generated during the specified year, categorizing them into various material types. Here's an interpretation of the graph.

1. **Biodegradable**: This category accounts for 61% of the waste generated in 2013. Biodegradable waste typically includes organic materials like food scraps, yard waste, and other items that can decompose naturally.
2. **Paper/Leather/Cardboard**: This category represents 9% of the waste. It includes items such as paper products, leather items, and cardboard packaging.
3. **Rubber/Debris**: This category makes up 4% of the total waste. It may encompass rubber materials and general debris or non-recyclable waste.
4. **Glass**: Only 1% of the waste generated in 2013 falls into the "Glass" category. This typically refers to glass bottles, containers, and other glass-based products.
5. **Plastic**: The "Plastic" category accounts for 7% of the waste. This includes various plastic items like packaging, bottles, and other plastic waste materials.

6. **Metals**: The "Metals" category represents 1% of the total waste and includes metal items such as aluminium cans and other metal-based products.
7. **Others**: This category includes 16% of the waste. "Others" is a broad category that might include miscellaneous items that don't fit neatly into the other categories, like textiles, ceramics, or items made from composite materials.

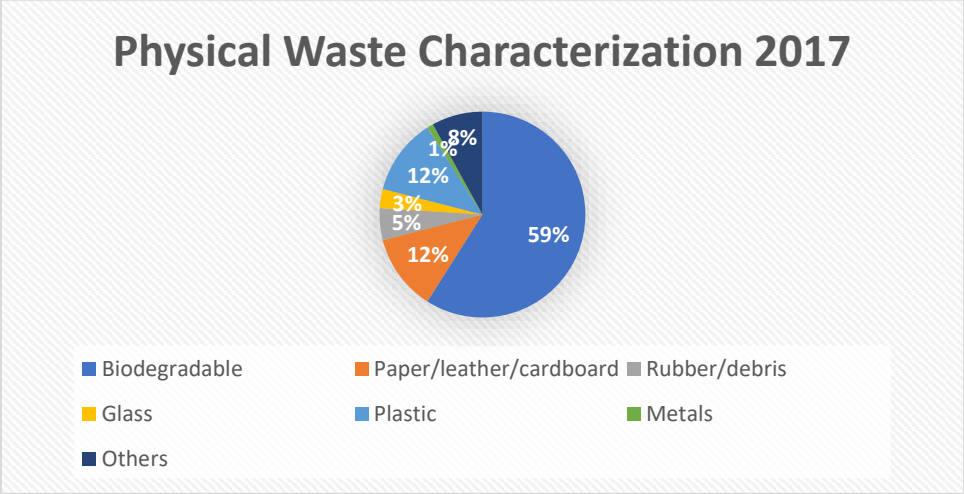


Figure: Physical Characterization of waste 2017 (For Reference)

The graph above shows data on waste characterization (Physical Characterization) for the year 2017, sourced from the Bruhat Bengaluru Mahanagara Palike (BBMP). Here's the interpretation of the table:

1. **Biodegradable**: Biodegradable waste accounts for 59% of the total waste generated in 2017. This category typically includes organic materials that can naturally decompose, such as food scraps, yard waste, and other organic matter.
2. **Paper/Leather/Cardboard**: The "Paper/Leather/Cardboard" category represents 12% of the waste. It includes items like paper products, leather items, and cardboard packaging.
3. **Rubber/Debris**: This category makes up 5% of the total waste. It may encompass rubber materials and general debris or non-recyclable waste.
4. **Glass**: Glass waste represents 3% of the total waste generated in 2017. This category includes glass bottles, containers, and other glass-based products.
5. **Plastic:** The "Plastic" category accounts for 12% of the waste. It includes various plastic items like packaging, bottles, and other plastic waste materials.
6. **Metals**: The "Metals" category represents 1% of the total waste and includes metal items such as aluminium cans and other metal-based products.
7. **Others**: This category accounts for 8% of the waste. "Others" is a broad category that might include miscellaneous items that don't fit neatly into the other categories, such as textiles, ceramics, or items made from composite materials.

Further details of the above data can be seen below:

Table 12: Waste Characterization by BBMP (For Reference)

SL. NO.	TYPE OF WASTE	WASTE COMPOSITION (%)
1	Vegetable	30 %
2	Paper	8 %
3	Plastic	12 %
4	Cardboard	4 %
5	Textiles	4 %
6	Grass/ leaves/ wood	6 %
7	Leather	0 %
8	Electronic Item	2 %
9	Metal	1 %
10	Organic	23 %
11	Glass	3 %
12	Debris	5 %
13	Biomedical	2 %
TOTAL		**100%**

Source: BBMP,2017

4.5 DPR on GVP by Sky Group

Table13: DPR on GVP by Sky Group (For Reference)

Type of waste	Percentage (%)
Clothes	6.34
Plastics	28
Glass	1.28
Leather	0.8
Coconut	5.56
Metals	-
Stones	1.96
Rubber	0.88
Wood	0.16
Compost	54.2

4.6 Survey

A survey was undertaken to assess the physical characteristics of waste over a seven-day period in November 2023. The resultant data has been analysed and presented in the form of a pie chart, aiming to enhance clarity in designing a robust Solid Waste Management structure. This framework is intended to accommodate and process waste efficiently and effectively.

a) Procedure for Waste Characterization

To carry out the waste characterization, Solid waste of 10 kgs was collected from various locations (Garbage transfer points) of the town. The waste collected was then thoroughly mixed and reduced by applying the coning and quartering method (IS: 9235 – 1979). The representative quantity of waste was subjected to physical analysis, determination of moisture and then the sample is processed for further chemical analysis. (IS: 9234 - 1979, IS: 10153 – 1982, IS: 8769 – 1978, IS: 1350 – 1974).

The physical characteristics like moisture content, density, percentage of different components, such as paper, plastic, glass, metal, organic matter, sand, soil, bricks, stones etc. were calculated.

b) Physical Composition of Waste (For Reference)

Table14: Physical Waste Characterization as per Survey (For Reference)

Physical Waste Characterization as per Survey								
	SURVEY DATES							
Particulars	**22-Nov-23**	**23-Nov-23**	**24-Nov-23**	**25-Nov-23**	**26-Nov-23**	**27-Nov-23**	**28-Nov-23**	**Average**
Vegetable & Food Waste	36.62%	38.31%	36.06%	41.13%	38.87%	41.69%	40.00%	38.95%
Fine organic matters	22.89%	23.94%	22.54%	25.70%	24.30%	26.06%	25.00%	24.35%
Grass	1.95%	2.04%	1.92%	2.19%	2.07%	2.22%	2.13%	2.07%
Leaves	1.95%	2.04%	1.92%	2.19%	2.07%	2.22%	2.13%	2.07%
Wood	1.30%	1.36%	1.28%	1.46%	1.38%	1.48%	1.42%	1.38%
Paper	5.31%	6.37%	6.64%	4.78%	6.11%	5.58%	6.00%	5.83%
Plastic	8.85%	10.62%	11.06%	7.96%	10.18%	9.29%	10.00%	9.71%
Cardboard	1.33%	1.59%	1.66%	1.19%	1.53%	1.39%	1.50%	1.46%
Textile	1.77%	2.12%	2.21%	1.59%	2.04%	1.86%	2.00%	1.94%
Leather	0.09%	0.11%	0.11%	0.08%	0.10%	0.09%	0.10%	0.10%
Metal	0.88%	1.06%	1.11%	0.80%	1.02%	0.93%	1.00%	0.97%
Glass	1.77%	2.12%	2.21%	1.59%	2.04%	1.86%	2.00%	1.94%
Debris	13.00%	5.00%	8.00%	8.00%	6.00%	3.50%	5.00%	6.93%
WEE Item	0.57%	0.86%	0.86%	0.29%	0.57%	0.43%	0.400%	0.57%
Sanitary Waste	1.43%	2.14%	2.14%	0.71%	1.43%	1.07%	1.000%	1.42%

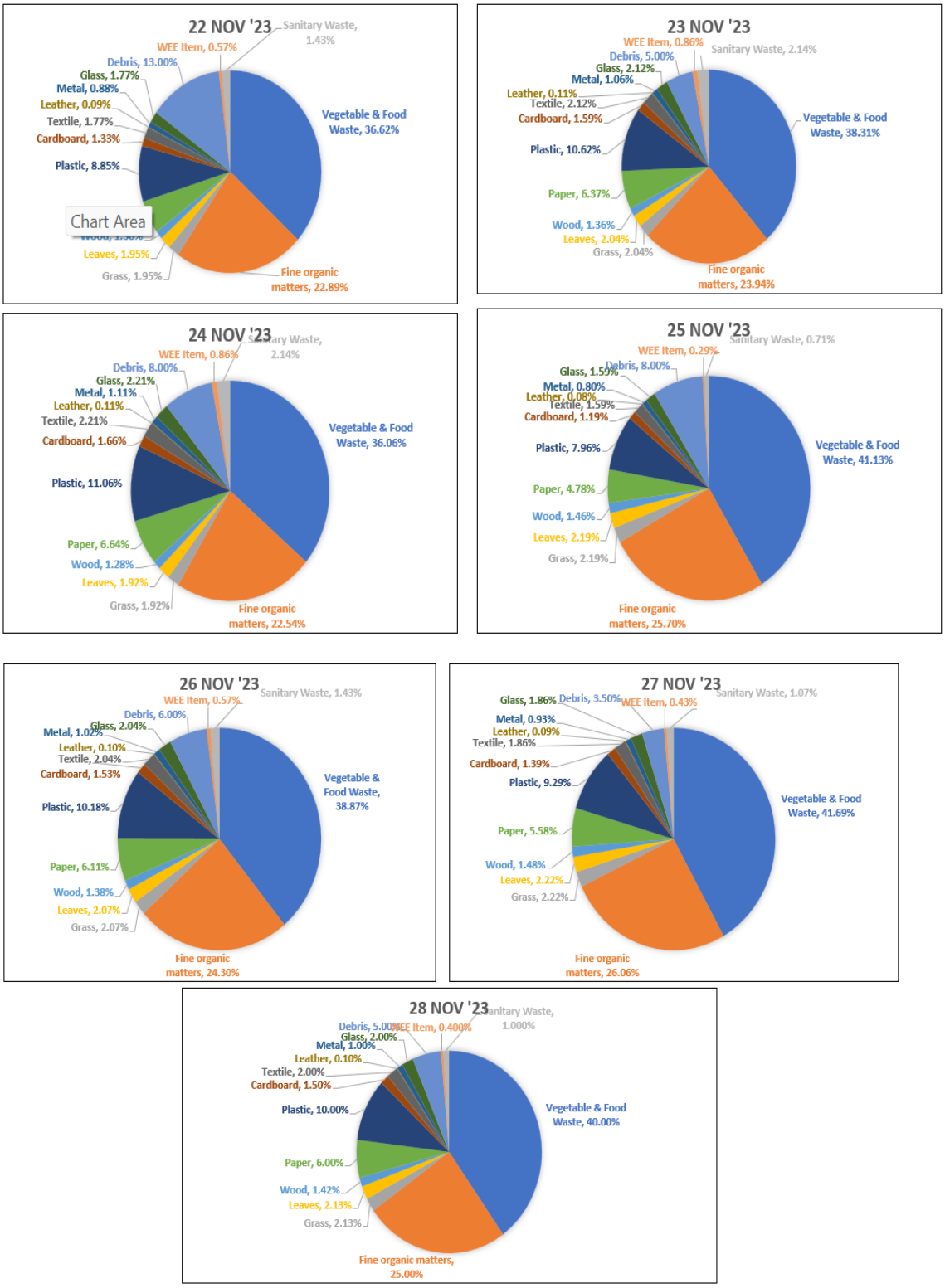


Figure : Physical Waste Characterization as per Survey

From the above survey, the Inferences are as follows:-

Item	22-Nov	23-Nov	24-Nov	25-Nov	26-Nov	27-Nov	28-Nov	Average
Organic Waste (Vegetable & Food waste, Grass, leaves, wood, fine organic matters etc.)	65%	68%	64%	73%	69%	74%	71%	69%
Recyclables (Leather, Plastics, Paper, Cardboard, Metals, Glass, etc.)	20%	24%	25%	18%	23%	21%	23%	22%
Inert (from the domestic sweeping and other activities)	13%	5%	8%	8%	6%	4%	5%	7%
Others (WEE Item, Sanitary Waste, etc.)	2%	3%	3%	1%	2%	2%	1%	2%

NOTE: The reports/ information provided in the PIM to give a fair idea to the intending bidders. However, the intending bidders to need study the city scenario, jurisdictions, waste characterization and assess on their method of arriving the waste quantity, quality and its physical and chemical compositions to establish the processing facilities as per the SWM rules 2016/ SBM-2.0 or any other statutory rules prevailing in India.

5. SUMMARY OF PROPOSED PROJECT

The intending bidder must establish the Integrated solid waste Management (ISWM) in every step of Collection, transportation, processing and measures to reduce waste generation from the source by increasing the IEC activities and further reduce the landfill by 100% processing the waste collected/received by the concessionaire

1. Integrated Solid Waste Management (ISWM) has a broad meaning which includes the following:
   a. Waste Reduction
   b. Reuse of Waste
   c. Waste Recycling
2. ISWM shall be considered as
   a. Combination of waste management techniques to treat different types of waste in ways that are Environmentally, Financially and Socially Sustainable.
   b. Based on Waste hierarchy (Reduction>Reuse>Recycling>Recovery>Disposal).
   c. Collaboration of all stakeholders.
3. ISWM Concept shall be considered as
   a. **Equity**: Allocation of resources, services and opportunity to all segments of Population.
   b. **Effectiveness**: Management Methods to meet overall aim of waste management plans- waste collected and disposed in a safe way.
   c. **Efficiency**: Increasing output from a given input or minimising input for a given output.
   d. **Sustainability**: Effective and long lasting- social, environmental and economic factors are important.
4. Effective implementation of segregation of waste at source by all waste generators, and at all levels and scale and an integrated Transportation mechanism shall be established
5. Their SWM shall be linked to the 4R approach (Reduce, Reuse, Recycle and Recover) and principles of circular economy which also emphasises the importance of waste reduction, reuse, recovery and recycling over other forms of waste processing or management.
6. Open burning and dumping of solid waste (without being properly treated) is prevented with strict rules.
7. The State Government and BBMP will ensure the health, safety and dignity of every person and stakeholder involved in handling Solid Waste in all respects.
8. BBMP shall emphasise on not only 100% door to door collection of waste but also process the waste through appropriate number of Integrated Solid Waste Processing Centres shall be proposed to implement as per the SWM Rules 2016.
9. Bengaluru like other cities is facing the problems due to old dump yards situated close to the expanding cities. These dump yards need to be reclaimed for the growing needs of the city infrastructure development. This is the case for many cities in India with an alarming rate of the urbanization process. Also, these create a nuisance in the town, and the same

needs to be stabilized or reclaimed. The waste sites that were earlier in the periphery of the corporation limits of Bengaluru City are now in the development zone of a more magnificent Bengaluru City, It can be seen from a satellite image that the built-up area has come near and around the earlier dump sites. Thus, it is clear that most of the old dumpsite which is existing around Bengaluru has become potential places for development.

10. All the existing dumps needs to be rehabilitated and remediated and maintained and monitored for over long period of time to ensure better environmental parameters meeting the standards.

5.2 Proposed Objectives of Work:

The scope of the Project shall mean and include, during the Concession Period, Design, Build, Finance, Operate and Transfer (DBFOT) of facilities and infrastructure for:

a) Door-to-door collection of waste
b) Primary storage of collected Waste;
c) Secondary collection, segregation, and transportation of SW;
d) Design, Construction and operation & maintenance of SW processing facilities and Waste to Energy Processing Facility (Dry Waste) & Waste to Gas (Wet Waste) for the Obligated Quantity of SW during the Concession Period; however, the Concessionaire may also have provision for adding extra capacity to the WtE Plant to accommodate the growth in SW potential in the coming years subject to mutual agreement of the BBMP and the discoms.
e) Processing of Wet Waste through setting-up of Waste to Bio CNG Plant.
f) Performance and fulfilment of all other obligations of the Concessionaire in accordance with the provisions of this Agreement and matters incidental thereto or necessary for the performance of any or all of the obligations of the Concessionaire under this Agreement.
g) Project Facilities: The Concessionaire shall construct the Project Facilities in accordance with the provisionsof this Agreement including the BackgroundDocuments
h) Any other activity which the government may by Act declare/notify to be undertaken for SWM as per SWM rules 2016
i) The scope of the Project shall also include any and all other activities that are ancillary to the above-mentionedscope of the Project. Background document shall form part of the Scope of the project.

5.3 Door-to-Door Collection

The collection service has to start from door step of the SW producer i.e. source. The Concessionaire shall collect segregated SW (biodegradable and non-biodegradable) in an auto tipper containing two-bins, having colour coded system as per SWM Rules 2016 and a Management Information System (MIS) for monitoring of SW collection, aimed at 100 per cent SW pickup. The concessionaire shall segregate SW while receiving from the source if it is delivered un-segregated, however the BBMPshall endeavor/ enforce source segregation practices on the waste generators through IEC initiatives, incentivization, levying fines etc.
The colour coding of the bins (and also of the corresponding transporting vehicles) have to

be as per the S W M Rules, 2016. Efficiency has to be achieved by deployment of mechanized system. Manual systems will be allowed only on those roads where mechanical system may not be feasible due to lesser right of way.

Note: Bin(s)of required size [in any number, as per their requirement] to segregate the SW at source shall be purchased/maintained by the producer/generator him/herself.

5.4 Transportation of Solid Waste

The waste collected from the doorsteps will be brought to the transfer stations, where it is/would be shifted to transfer trailers/ containers (no transfer of SW at ground). All waste to be compacted at Transfer stations in the process of transfer from small auto tipper to the large containers and remove the leachate and collect the same leachate and to be transported by the concessionaire to the processing center and utilize such leachate as liquid media in BIO CNG processing digesters.

Different types of waste would be transported in different vehicles which would also be colour coded as above. From the transfer stations, different types of waste would be sent to respective destinations for further processing and final disposal. The transportation vehicle shall be fixed with Geographic Positioning System (GPS) and a MIS based monitoring mechanism. All the vehicles would be fitted with GPS tracking equipment. The GPS would be accessible from the BBMP control room, also. The BBMP Control room shall be set up as well as operated and maintained by the Concessionaire.

The Concessionaire shall also arrange necessary infrastructure/spare parts etc. and manpower for the purpose of regular maintenance of the vehicles, machinery & equipment. Necessary infrastructure for movement of every vehicle by using Real time GPS (Global Positioning System) /GSM (Global System for Mobile Communication) shall be provided at the BBMP Control Room by the Concessionaire. The Concessionaire will allow the access to monitoring system [as and when required] to independent consultant as well as to the staff of the BBMP. The Concessionaire shall be obligated to collect, transport and process any SW as instructed by the BSWML/BBMP within the project area (as defined in the Schedule 1) on receipt on written communication from the BSWML to this effect.

5.5 Transfer Stations

The existing Mini transfer stations at 24 locations are proposed to be converted and/or augmented as larger transfer stations at the COST of the BBMP/BSWML/GOK or BBMP/BSWML shall contruct the new large transfer stations at the BBM/BSWML COST and handover such transfer stations to corresponding concessionaires. 3 large size transfer stations under execution are considered to be part of the project after the expiry of the contract or after the defect liability period of such contracts being executed to establish these transfer stations by existing contracts of BSWML and shall be decided by Authority. The additional transfer stations which are under proposal to construct shall be taken into the part of the project. The transfer stations would be augmented for all weather operations

and would be environmentally compatible for proximity to inhabited localities. Therefore, these would have the following components:

a) Adequate space for all operations within the premises of the transfer station, which would have solid wall fencing of minimum 2 m height.

b) Operations within the transfer station would be under cover, so that dust and noise could be effectively controlled. At the same time, the operation would not be hampered during precipitation as well.

c) All internal roads, ramp and platforms at different levels would be concrete built and should withstand load of moving machineries/vehicles.

d) The transfer station shall be maintained as per the standards set in the O&M Manual. The wash water should go through a sediment basin and then to the city sewer.

e) The selected operator would have to make appropriate site-specific designs as per the type of vehicles and containers to be handled and the method applied for transfer of the waste.

f) Prospective designs may be discussed with the BBMP during the pre- bid meeting but detailed discussion followed by written approval would have to be taken from the Independent Engineer for their adequacy, before construction.

5.6 Processing Technologies

The BSWML desires that its SW management system shall be a model system for the country, which would scientifically collect, transport, process and dispose of SW, have maximum recycling and recovery, and create public awareness. Without prejudice to the generality of the foregoing, Concessionaire shall develop the Project Facilities using proven technology or technologies that it had proposed in its Bid to the RFP which should be again proven technology and approved by any of statutory bodies of CPCB, MOHUA, SBM 2.0 or other state PCB's, adhering to SolidWaste Management Rules, 2016 and in accordance with terms of this Agreement and Applicable Law (the—Proven Technology) which ensures:

a) The bio-degradable and recyclable content of the SW is separated transfer stations and recyclable waste to be sent to existing/ proposed DWCCs.

b) A suitable technology has to be used for Processing of the bio-degradable content of the SW;

c) A suitable technology has to be used for Processing of combustible content ofthe SW;

d) A suitable technology has to be used for recovering and processing recyclable content of the SW,

e) Not more than 20% of the SW received for the processing at the ISWM Facility is disposed of in the Scientific Landfill after processing. The severe penalties on non-adhering to this is as per the Schedules mentioned in the DCA. Every waste reach to processing centre must process before sending to the landfill except hazardous wastes.

5.7 Waste to Energy Processing facility

The Concessionaire shall develop the Waste to Electricity processing facility with all associated project facilities to process Solid Waste (SW) with an aggregate capacity of the corresponding packages (± 20%) TPD. The schedule for the processing through WTE is attached in DCA. The concessionaire shall consider following criteria for technology selection for designing of project facilities using proven and approved technology/ technologies which should be again proven and approved technology and approved by any of statutory bodies of CPCB, MOHUA, SBM 2.0 or other state PCB's, adhering to SolidWaste Management Rules, 2016 and in accordance with terms of this Agreement and Applicable Law (the—Proven Technology) which ensures:

a) Waste to electricity processes through conversion of dry non-recyclable combustible fraction in the form of pellets or fluff produced by drying, shredding, dehydrating

b) Chlorinated plastics shall not be incinerated

c) The furnace must be designed in line with best available technologies to ensurestableandcontinuousoperationandcompleteburnoutofthewasteandfluegas es

d) Minimum power generation capacity to be achieved is MW at full scale operations

e) The CO2concentration in tail gas shall not be less than 7% and CO should not be100mg/Nm3

f) Minimum gas phase combustion temperature of 850°C- 950°C and a minimum residence time of the flue-gases, of two seconds after the last incineration air supply

g) Optimum oxygen content(~lowerthan6%) should be maintained in order to minimize corrosion and ensure complete combustion. The carbon monoxide content of the flue gas is a key indicator of the quality of combustion.

h) Fly ash acts as a catalyst for de-novo synthesis (at 200-450°C) of dioxins and furans. In order to reduce formation of dioxins and furans, it is imperative that maximum fly ash is removed before gases cool down to 200-450°C.

i) The flue gases produced in the boilers should be treated by an elaborate flue gas treatment system

j) Incineration plants shall be operated (combustion chambers) with such temperature, retention turbulence, as to achieve total Organic Carbon (TOC) content in the slag and bottom ashes less than 3% or their loss on ignition is less than 5% of the Dry Weight

k) Achieving >70% PLF (Plant Load Factor) for First year and thereafter >75% PLF from Second Year Onwards

l) Commercially established technology (1 year of track record) and provide details such as capacity, feedstock, PLF, plant efficiency

m) Allow only the non-usable, non-recyclable, non-biodegradable, non-combustible and non-reactive inert waste and pre-processing rejects and residues from Waste processing facilities to go to sanitary landfill. However, every effort shall be made to recycle or reuse the rejects to achieve the desired objective of minimizing the waste going to sanitary landfill.

n) Ensure that all the facilities are designed and constructed to meet the present requirements. If needed, the concessionaire can go ahead to scale up/ expand the Project facility to meet the requirements of handling future increase in waste generation over the concession period with the consent of the BBMP on the same project site without additional land.

o) Obtain all the pre-project approvals, clearances for the project from various statutory bodies which may be required to establish and operate the facility with all approvals and renewals as required during the concession period at concessionaire's own COST. BBMP shall facilitate concessionaire for obtaining such approvals.

p) Make all arrangement for all the Utilities like water, electricity etc. at his own COST. BBMP will provide the location from where the same can be drawn. All applicable charges and taxes shall be paid by concessionaire.

q) Carry out necessary activities for evacuation, selling, disposal of end products from the proposed facility.

r) Put up Flue Gas Cleaning System (FGCS), Leachate Treatment Plant (LTP) and any other environment management facility(ies), as required as per all applicable statutory requirements.

s) The proposed project facilities including Waste to Electricity shall meet all operating and emission standards as mentioned in SWM Rules 2016 and EU Standards.

5.8 Waste to CBG Processing Facility

The Concessionaire shall develop the Waste to Bio-CNG Processing facility using proven technology or technologies that it had proposed in its Bid to the RFP which should be again proven technology and approved by any of statutory bodies of CPCB, MOHUA, SBM 2.0 or other state PCB's, adhering to SolidWaste Management Rules, 2016 and in accordance with terms of this Agreement and Applicable Law (the—Proven Technology) which ensures with an aggregatecapacity of the corresponding package quantity of waste fit for the CBG process (± 20%) TPD comprising of the following basic requirements:

a) A suitable technology to limit the emissions and discharges from the facility and limit the parameters well within the stipulated norms by Central Pollution control Committee (CPCB) or the State Pollution Control Board (SPCB)

b) The segregated Wet Biodegradable organic fraction of the waste shall be sent as feed to the Bio-CNG Plant.

c) Compost Plant of required capacity for processing of solid digestate.

d) Obtain all the pre-project approvals, clearances for the project from various statutory bodies which may be required to establish and operate the facility with all approvals and renewals as required during the concession period at concessionaire's own COST. BBMP shall facilitate concessionaire for obtaining such approvals.

e) Compressed Bio Gas (CBG) to be supplied shall meet IS 16087:2016 specifications of BIS. The following shall also be met as per the IS 16087:2016 specifications:

f) The CBG is to be compressed and supplied through Cascades/ Pipe to the gas distribution Company Retail Outlets. The off-take of CBG by the respective Gas Distribution Company shall be as per the demand in the market.

5.9 Assumptions to be adopted by intending bidders:

Based on the scope of work and objectives, the following methodology/ assumptions has to be adopted follows:

a) Assessment of the population within BBMP and Bengaluru urban district.

b) The household numbers have to be arrived based on the standard yardstick given by SBM 2.0 and CPHEEO norm and Draft Master Plan 2031.

c) The capacity of the vehicles for the primary transportation are to be at 2 cum capacity auto tippers or any other suitable size and capacity as per the norms where 2 cum auto tippers cannot go in small lanes and slum areas.

d) The secondary transportation has be taken up with large size containers which can be carried by GVW Hook loaders.

e) There are 30 divisions within the jurisdiction and it proposed to have minimum one transfer station per 1 division within BBMP area. However, Bidder can propose and get approved by the authority at the time of IIOP, thereby construct and operate (land will be provided by the Authority) such extra no of transfer stations in Bangalore Urban District area to manage the solid waste efficiently and effectively.

f) The existing Mini transfer stations at 24 locations are proposed to be converted and augmented as larger transfer stations at the COST of the BBMP/BSWML/GOK. 3 large size transfer stations under execution stage are considered to be part of the project after the expiry of the present contract or after the defect liability period which shall be decided by Authority. The additional transfer stations which are under proposal to construct shall be taken into the part of the project.

g) The existing compost processing plants at 6 locations are considered to be the part of the project and these processing plant shall be handed over the new concessionaire based on the jurisdiction of the concessionaire. The FINANCIAL GRANT UNDER SBM 2.0 fund shall be considered as zero towards capital investment for these processing plants and concessionaires may make good for operational to process the waste at these processing centres at the COST of the concessionaire

h) Minimum1 Auto tipper to cover 1,250 households within BBMP limits and 750

households outside the BBMP limits for the Bengaluru urban district areas. However, at the discretion of the concessionaire, these numbers can be decided with the authority.

i) The Waste characterization has been taken into consideration to assess the type and size of processing facilities. The final waste characterization has been carried out the intending bidders before submitting their

j) The jurisdiction of the study shall cover the area of BMMP and Bengaluru Urban district.

5.10 Assumptions considered for this project:

1. No of wards

Chief Commissioner BBMP Shri Tushar Girinath released the official notification dated: 29.12.2023 to re-establish the BBMP wards from 198 to 225 with 30 divisions.

The proposed Integrated Solid Waste Management plan has to up to study based on the above referred notification.

2. Population Projections:

The population growth within BBMP Limits on average growth of 3.8% Year on Year (YoY) on 2011 census (The Population Census of 2021 report is not available as on date due to Covid-19 pandemic issues) and other than BBMP limits it is 4.26% YoY for the urban district and accordingly the population assessment has been carried for the Year 2023.

The population of the study area is about 1.47 crores (approx.), which includes population of around 1.32 crores (approx.) from Bruhat Bengaluru Mahanagara Palike (BBMP), 0.056 crores (approx.) from areas other than BBMP (urban districts) and the floating population of around 0.097 crores (approx.).

3. Proposed packages

The entire study area has been made into four packages as follows:

1. **Package-1**: Yelahanka zone and Dasarahalli Zone **(**Hebbala and Pulikeshinagar divisions from Package-3 are taken in Package-1 to balance the population among the four packages).
2. **Package-2:** RR Nagar Zone and West Zone
3. **Package-3:** East Zone & Mahadevapura zone
4. **Package-4**: South Zone and Bommanahalli Zone

The details of the Packages are placed at Annexure-2 (Packages)

Quantification of the waste: The waste generation based on the population projections and the summary of the same is as follows which indicative to give the fair idea to the bidders to calculate the total requirements arrive the tipping fee

Jurisdiction	Year	2011	2018	2023	2025	2031	2041
BBMP	population	**8443675**	**10962585**	**13209907**	**14232935**	**17802401**	**25849498**
	per capita @ 400 Grams	**3377**	**4385**	**5284**	**5693**	**7121**	**10340**
Urban District		**339887**	**441282**	**531744**	**572925**	**716608**	**896325**
	Par capita waste generation @350 grams	**119**	**154**	**186**	**2005**	**251**	**314**
Floating population		**519000**	**673828**	**978413**	**1054186**	**1223789**	**1530702**
	Par capita waste generation @400 grams	**208**	**270**	**391**	**422**	**490**	**612**
1	Total Population of BBMP+ UD+ Floating population						**14720064**
2	Total Solid waste of BBMMP+ UD+ Floating population in TPD						5861 TPD
3	Street sweeping waste derived based DPR for the GVP by BBMP assessment with projected assessment year of 2023						670 TPD

4. The distribution of the wards and population in each package is as follows:

Table 15: Zone wise Population and waste estimate

	Zone	Division	Sub-Division	Population 2023
Package 1	Yelahanka Zone	Yelahanka	Yelahanka BBMP	134789
			Yelahanka Bangalore Urban District (Chikballapur)	103648
			Yelahana Sattelite Town BBMP	133518
		Byatarayanapura	Byatarayanapura BBMP	123612
			Byatarayanapura Blr Urban District (Blr North)	64128
			Kodigehalli BBMP	115386
			Vidyaranyapura BBMP	346583
			Hosakote Bangalore Urban District (Chikballapur)	2711
	Dasarahalli Zone	Dasarahalli	Shettyhalli BBMP	134363
			Dasarahalli BBMP	124621
			Peenya Industrial Area BBMP	61111

		Hegganahalli	Peenya Industrial Area BBMP	66011
			Hegganahalli BBMP	317122
		Hebbal	Hebbal BBMP	220896
			Hebbal Bangalore Urban District (Bangalore North)	2603
		Pulikeshinagar	J C Nagar BBMP	221483
			Kadugondanahalli BBMP	237834
			Pulikeshinagar BBMP	171178
Package 2	Rajarajeshwari Nagar Zone	Rajarajeshwari Nagar	Rajarajeshwari Nagar BBMP	125796
			Laggere BBMP	105824
			Lakshmidevi Nagar BBMP	127225
		Yeshwanthpur	Yeshwanthpur BBMP	357582
			Yeshvanthapura Bangalore Urban District (Bangalore North)	118076
		Kengeri	Kengeri BBMP	181460
			Herohalli BBMP	265838
			Bangalore South Bangalore Urban District (Bangalore Rural)	110482
			Anekal Bangalore Urban District (Bangalore Rural)	113315
	West Zone	Malleswaram	Mathikere BBMP	166121
			Malleswaram BBMP	214962
		Gandhinagar	Gandhinagar BBMP	215304
			Chickpet BBMP	173383
		Rajajinagar	Sriram Mandira BBMP	177009
			Rajajinagar BBMP	186620
		Govindaraja Nagar	Govindaraja Nagar BBMP	272491
			Chandra Layout BBMP	205808
		Chamarajpet	J.J.R. Nagar BBMP	209713
			Chamarajpet BBMP	161787
		Mahalakshmipura	Mahalakshmipura BBMP	243119
			Nagpura BBMP	248238
Package 3	East Zone	Sarvagna Nagar	Maruthisevanagar BBMP	242073
			HBR Layout BBMP	345301
		C V Raman Nagar	Jeevan Bhim Nagar BBMP	177045

			C V Raman Nagar BBMP	293502
		Shivajinagar	Shivajinagar BBMP	169727
			Vasanthnagar BBMP	161513
		Shanthinagar	Shanthinagar BBMP	164379
			Domlur BBMP	229917
	Mahadevapura Zone	K.R. Puram	Horamavu BBMP	117999
			K.R. Puram BBMP	255400
			K.R. Pura Bangalore Urban District (Bangalore North)	6467
			HAL Airport BBMP	325944
		Mahadevapura	Hoodi BBMP	131283
			Whitefield BBMP	177006
			Marathalli BBMP	367526
			Mahadevpura Bangalore Urban District (Bangalore Central)	38018
Package 4	South Zone	Padmanabhanagar	Padmanabhanagar BBMP	227679
			Banashankari BBMP	251602
		Jayanagar	Jayanagar BBMP	241996
			J P Nagar BBMP	117564
		BTM Layout	BTM BBMP	239583
			Koromangala BBMP	272495
		Chickpet	Kempegowdanagar BBMP	242101
			Hombegowdanagar BBMP	124498
		Vijayanagar	Vijayanagar BBMP	228482
			Gali Anjaneyaswamy Temple BBMP	278994
		Basavanagudi	Basavanagudi BBMP	179680
			Girinagar BBMP	200880
	Bommanahalli Zone	Bommanahalli	H S R Layout BBMP	113603
			Bommanahalli BBMP	177629
			Bommanahalli Bangalore Urban District (Bangalore South)	1274
			Arakere BBMP	434008
		Uttarahalli	Uttarahalli BBMP	126128
			Yelachenahalli BBMP	119501
			Anjanapura BBMP	121718
			Begur BBMP	64187
		Anjanapura	Begur BBMP	54763
				209266

Note: Package-1: Yelahanka zone and Dasarahalli Zone (Hebbala and Pulikeshinagar divisions from Package-3 are taken in Package-1 to balance the population among the four packages).

Based on the above table, the assessments are carried for House Holds, quantity calculations for each package in each option has been carried and the assessment of the vehicles have been carried for the primary and secondary transportation. The summary of the vehicles as follows.

5. The summary of the vehicles:

The broad calculations given here is indicative and bidders are required to provide the minimum number of the vehicles as indicated below and however more than these numbers can be deployed based on the need to transport the SW of Bengaluru Urban District jurisdiction waste as per SWM rules 2016.

Packages	Volumetric quantity of waste per transfer station	Auto tippers requirement per transfer station by 2 trips per auto	Total requirement of auto tippers per package	Containers of 20 Cum		Hook loaders	
				carrying capacity in Cum	quantity per TS with 10% spares	No. of trips per Hook loader including break down and maintenance	Required Hook loaders to transfer the containers from TS to P&D centre
Pkg-1	328	82	542	20	109	3	40
Pkg-2	338	84	836	20	168	3	62
Pkg-3	408	102	672	20	135	3	50
Pkg-4	342	85	846	20	170	3	63
Total			2895		582		215

From the above options, the summary of the assessment of vehicles and quantification are as follows.

Processing & Disposal

For P&D works, 550 gm/day/capita of waste generation is taken excluding the existing commitments

Summary of P&D can be seen under as

Table17: Quantification of waste estimation

QUANTITY DISTRIBUTION				
A	**Total population**	**14720064**	U.O.M	Percentage
	Per capita (including bulk waste)	550	grams	
B	Total Quantity per day excluding road sweeping waste	8096	TPD	
C	**Assessment of quantities for various processes**			
1	Sani waste	81	TPD	1%
2	Animal Waste from shops (Meat waste)	81	TPD	1%
3	Animal Carcass	10	TPD	
4	Domestic Hazard waste	81	TPD	1%
6	Stones	81	TPD	1%
7	Silt & Inerts	162	TPD	2%
8	Debris	81	TPD	1%
D	**Balance Qty available for processing**	**7519**		
	Derived Dry Waste after discounting quantities 'C'	3481	TPD	43%
	Derived Wet waste after discounting quantities 'C'	4048	TPD	50%
E	**Assessed Processing Quantities**			
1	5% Leachate (considered for Bio methanation)	405	TPD	5%
F	**Balance Quantities**			
1	Dry waste	3481	TPD	
2	Wet waste	3643	TPD	
G	**Existing commitments**			
1	MSGP (Wet waste)	900	TPD	
2	Bio Methanation plants (wet waste)	105	TPD	
3	GAIL (wet waste)	300	TPD	
4	Coconut (dry waste)	313	TPD	9%
5	Recyclables (dry waste)	696	TPD	20%
6	KPCL (Dry waste)	600	TPD	
7	Inerts from RDF	104	TPD	3%
H	**Balance Qty available for processing under revenue generation model**			
1	For Wet waste	2338	TPD	
2	For Dry waste	1767	TPD	
I	**Street sweeping waste**	**670**	**TPD**	
1	Organic fraction of Street sweeping waste	101	TPD	15%
2	Silt for Landfill (Inerts from Street sweeping)	570	TPD	85%
J	Inerts from Bio Methanation	142	TPD	5%
K	**Existing Animal waste Plant**	8	TPD	
L	Existing Sani waste plant	25	TPD	

A summary of the above statement can be seen under as follows:

Table18: Quantification of waste Processing (indicative)

Sl. No	Name of Process	Quantities (TPD)
1	Landfill (C6+C7+C8+G7+I2+J)	1140
2	Bio Methanation(E1+H1+I1)	2844
3	WTE(H2)	1767
4	Animal Rendering(C2-K)	73
5	Animal Carcass(C3)	10
6	Sani waste(C1-L)	56
7	Domestic Hazardous(C4)	81
8	Saleable Recyclables(G5)	696
	Total	**6667**

Note: Leachate is proposed to be considered in Bio methanation processing as media in digesters

Summary of Estimated waste quantum to be received at processing facilities for Processing and Disposal of Solid waste.

Table19: Divison wise populations & waste estimation

Sl No.	Zones	Divisions	Population	TPD
1	Yalahanka & Dasarahalli (Package 1)	6	2751567	1246
2	RR Nagar & West zone (Package 2)	9	4238181	1920
3	East zone & Mahadevapura (Package 3)	6	3423111	1550
4	South zone & Bommanahalli Package 4)	9	4307205	1951
	Total		**14720064**	**6667**

Further the package wise details can be seen under as:

Table20: Package wise waste details for processing

Sl. No	Particulars	Total	Package 1	Package 2	Package 3	Package 4
1	Bio Methanation	**2844**	532	819	661	832
2	WTE	**1767**	567	0	600	600
3	Landfill	**1140**	213	328	265	334
4	Leachate	**0**	0	0	0	0
5	Animal Rendering	**73**	14	21	17	21
6	Animal Carcass	**10**	2	3	2	3
7	Sani waste	**56**	10	16	13	16
8	Domestic Hazardous (Segregation & Transportation)	**81**	15	23	19	24

9	Saleable Recyclables	**696**	130	200	162	204
		6667	**1483**	**1410**	**1739**	**2034**

Note: Waste received at processing plants by pre-sorting and processing for the RDF to send to the existing commitment of KPCL at Bidadi, and similar processed RDF proposed process at WTE at 3 processing plants having a minimum capacity of 600 TPD at each plant.

5. 11 Primary Collection & Transportation

Collection and Transportation are functional elements of the Solid Waste Management value chain. The collection of segregated waste plays an important step in the handling, storage, and sorting of waste. Waste must be collected, sorted, and stored in the right and scientific manner. It is recommended that household waste is collected in the morning.

The segregated waste would be collected from the generators through primary vehicles and then transported to transfer stations or decentralized processing centres depending on whether it is dry or wet waste. At the decentralized facilities, any waste that remains after processing (rejects/inert) would then be transported to the sanitary landfill for scientific disposal. The collection and transportation plan shall focus on optimizing the resources i.e., vehicles and manpower, and ensure 100% door-to-door collection from all the potential generators.

It is proposed that the city plans for one transfer station in each division (within BBMP area and for Urban District area, Bidder has to propose their own Transfer stations as per their assessment) with a minimum capacity of approximately 150 TPD. The transfer stations will be located throughout the city to ensure efficient waste management.

For primary waste collection, auto-tippers of a capacity of 2 Cubic Metres will be used. The number of auto-tippers required is assessed based on the assumption that one auto-tipper will cover 1,250 households per day in the BBMP area, and 750 households per day in the Bengaluru Urban District areas that do not fall under BBMP jurisdiction. Auto-tippers of similar capacity shall be used to collect and transport the waste generated by the floating population. The number of auto-tippers required for collection of such waste has been assessed based on the assumption that 1 auto-tipper would cater to the population of 5000. An additional 10% of the total number of vehicles will be kept as spares in case of unavailability of the designated vehicles due to breakdowns or other issues. Each auto-tipper can make two trips per day.

The total number of Auto-Tippers required in each package of the recommended options is as follows:

Table21: Requirement of Auto-Tipper's package (indicative assessment)

	Requirement of Vehicles									Waste to be handled at each package										
	In BBMP limits 1 Auto tipper of 2.00 Cum capacity for every 1250	Number of auto tippers required for BBMP jurisdiction	Urban district limits 1 Auto tipper of 2.00 Cum capacity for every 500 HH	Number of auto tippers required for Urban	for every 5000-floating population with 1 auto	Number of auto tippers required for floating population	total Requirement of Auto tippers of 2.0 Cum	Add 10% towards spares	Total requirement of auto tippers	No. of transfer stations	BBMP @ 400 Grams per capita	quantity of package of BBMP	Floating @ 400 Grams per capita	quantity of package of Floating population	Urban district @ 350 Grams per capita	quantity of package of urban district	MSW quantity of the package	Share of Street sweep quantity on each package	total quantity to be dealt at each package	quantity per transfer station
	No. of HH	**Auto tippers**	**No. of HH**	**Auto tippers**	**Unit**	**Quantity**														
Pkg-1	1250	459	750	55	5000	37	551	56	**607**	6	400	963	400	73	350	69	1106	126	1232	**205**
Pkg-2	1250	694	750	109	5000	57	860	86	**946**	9	400	1455	400	113	350	137	1705	194	1899	**211**
Pkg-3	1250	602	750	15	5000	46	663	67	**730**	6	400	1263	400	91	350	18	1372	156	1528	**255**
Pkg-4	1250	767	750	1	5000	58	826	83	**909**	9	400	1611	400	114	350	1	1725	196	1922	**214**
		2522		**180**		198	**2900**		**3192**	**30**									**6581**	
The above-mentioned data is indicative and for reference, however bidders are free to establish the actual required infrastructure to adhere KPI's																				

The amount of waste to be handled in each package is presented below:

Table22: Distribution of waste in packages (for reference)

Packages	Quantity of package of BBMP	Quantity of package of Floating population	Quantity of package of urban district	MSW quantity of the package	Share of Street sweep quantity on each package	Total quantity to be dealt at each package	No. of Transfer Stations proposed	Quantity per transfer station
Package 1	963	73	69	1106	126	1232	6	**205**
Package 2	1455	113	137	1705	194	1899	9	**211**
Package 3	1263	91	18	1372	156	1528	6	**255**
Package 4	1611	114	1	1725	196	1922	9	**214**

5.12 Secondary Transportation

The primary collection vehicles shall collect segregated waste from all the generators in each zone. This segregated waste shall be either processed in decentralized processing units that are present within the city or transported to their respective designated integrated waste management processing & disposal facilities proposed in each package.

The secondary transportation includes components like:

a) A Transfer Station of a minimum of 150 TPD for each division
b) A Weighbridge at each Transfer Station based on Online / Information Technology monitoring systems connected to the Central Command Centre for monitoring purposes.
c) 20 cum. containers with hook lift vehicles (28 GVW)
d) Tipper Trucks (28 GVW) for emergency and GVPs clearance.
e) 15 cum. mobile compactors
f) JCB 3DX
g) Bob Cats
h) IEC Vehicles
i) Animal Rendering waste vehicles
j) Horticulture Vehicles
k) Carcass vehicles

The 28 GVW hook loaders to carry the 20 cum. containers shall make 3 trips in a day while the 14 cum. mobile compactors shall make 4 trips in a day. The requirement of the vehicles and equipment for Secondary Collection & Transportation is given below.

Table23: Vehicles and Equipment for Secondary C&T (for reference)

Particulars	Numbers
SECONDARY COLLECTION	
14 cu.m compactor mobile compactors to lift the waste from block spots/ bulk waste from function halls	30
28 T GVW Hookloaders	215
Tipper Trucks 28GVW (for Drain Silt & others)	30
JCB 3DX	30
Containers	
20 cum containers (to be carried by Hook loaders)	582
Other Vehicles	
Admin Vehicle	30
IEC (Tata 407)	60
BOB CATS	30
Carcass	12
Horticulture Vehicle	20

Table 24: The assessment requirement of vehicles for Collection & Transportation is presented below. (for reference)

Sl. No.	Options / Packages	Volumetric quantity of waste per transfer station	Auto tippers requirement per transfer station by 2 trips per auto	total requirement of auto tippers per package	containers of 20 Cum		Hook loaders	
					carrying capacity in Cum	quantity per TS with 10% spares	No. of trips per Hook loader including break down and maintenance	Required Hook loaders to transfer the containers from TS to P&D center
	Pkg-1	**328**	82	542	**20**	**109**	3	40
	Pkg-2	**338**	84	836	**20**	**168**	3	62
	Pkg-3	**408**	102	672	**20**	**135**	3	50
	Pkg-4	**342**	85	846	**20**	**170**	3	63
				2895		**582**		**215**

Table 25: Distance of Transfer station to Processing plant(for reference)

No. of Transfer stations	Transfer station Name			Distance (Kms)
6	Package 1	North Zone	11	31.56
			12	32.26
			18	37.18
			46(New TS at JC nagar)	41.44
			60 (New TS at Kadugondanahalli)	43.01
			78 (New TS at Pulikeshinagar)	44.08
			Total Average distance (Package-1)	**38.26**
9	Package 2	West Zone	65 (New TS at malleshwaram)	39.30
			42	38.30
			73	34.90
			Existing TS at Chickpet(171,172,173,174,165)	34.60
			198	32.40
			94	35.40
			13	33.10
			44	34.10
			125(New TS at Govindaraj nagar)	33.90
			Total Average distance (Package-2)	**35.11**
6	Package 3	East Zone	90	32.40
			Existing TS at Mahadevpura(107,108,109,110,113,114)	19.50
			85	23.70
			56	26.60
			58	28.50
			149	23.00
			Total Average distance (Package-3)	**25.62**
9	Package 4	South Zone	118	15.30
			197	7.37
			151	13.37
			192	8.42
			196	6.38
			194	4.66
			162 (New TS at Girinagar)	13.73
			Existing TS at BTM Layout (182,183,184,185,186,187,191)	10.24
			174 (New TS at HSR Layout)	12.15
			Total Average distance (Package-4)	**10.18**

On an average distance among 4 packages one side distance from Proposed Transfer station to nearby proposed Processing plant:26.00 Km. the secondary transportation distance shall be further assessed after the final establishment of the processing centers and Transfer stations of each package and accordingly the distance for the secondary transportation will be decided of the authority.

5.13 Processing and Disposal

Integrated Solid Waste Management (ISWM) is a strategic approach to managing waste in a sustainable manner. This involves a comprehensive and systematic process of waste management that encompasses various stages, including waste generation, segregation, collection, sorting, transfer, recovery, treatment, and disposal in an integrated and coordinated manner. The primary aim of ISWM is to optimize the use of resources while minimizing the quantity of waste that ends up in landfills. ISWM recognizes the fact that waste management is a complex and dynamic process that requires careful planning and execution. It offers an effective and efficient way of addressing the challenges of waste management by adopting a holistic approach that takes into account the entire life cycle of waste. This approach ensures that waste is managed in a manner that is environmentally sound, socially acceptable, and economically feasible. ISWM provides a framework for decision-making that involves setting priorities, identifying options, assessing the environmental impact, and selecting the most appropriate waste management practices. It promotes the use of sustainable and innovative technologies that can help reduce the environmental impact of waste while creating economic opportunities. ISWM is critical for sustainable waste management. It optimizes resource utilization, reduces waste generation, and minimizes environmental impact. Adopting ISWM results in significant environmental and economic benefits, while promoting sustainability.

A Solid Waste Management (SWM) Plan is proposed with the ISWM approach in mind, with a focus on reducing the amount of waste that is disposed of in landfills. The goal is to maximize resource conservation and efficiency. This approach will help in achieving the sustainability goals.

It is proposed to establish four integrated Municipal Solid Waste Processing and Disposal facilities, one in each of the proposed packages. These facilities shall be equipped with modern state-of-the-art amenities to ensure an efficient and effective system of solid waste management. The proposed locations for these facilities are in the four directions of the city to cater to the entire area of BBMP Urban and Rural. Each processing and disposal facility requires a minimum of 100 acres of land. It has been discussed and brought in Technical Committee meeting that a minimum 50 acres of land shall be provided for P&D site and another 50 acres for Scientific landfill in the form of Quarry. The packages and the estimated quantities of the processing plants in the respective packages of the recommended options are summarized below:

Table26: Estimated quantities in Packages in Option 3

Sl. No.	Zones	Divisions	Population	TPD
1	Yalahanka & Dasarahalli (Package 1)	6	2751567	1246
2	RR Nagar & West zone (Package 2)	9	4238181	1920
3	East zone & Mahadevapura (Package 3)	6	3423111	1550
4	South zone & Bommanahalli Package 4)	9	4307205	1951

	Total		14720064	6667

The components of the processing facility of municipal solid waste are selected based on the waste quantification, characteristics, land availability, and prevailing technical, socio-economic, and environmental conditions near the proposed locations and their catchment area. The following are the indicative major components / facilities in the Integrated Waste Processing Facility:

Table28: Major components in ISW processing facilities

Sl. No	Particulars	Total	Package 1	Package 2	Package 3	Package 4
1	Bio Methanation	**2844**	532	819	661	832
2	WTE	**1767**	567	0	600	600
3	Landfill	**1140**	213	328	265	334
4	Leachate	**0**	0	0	0	0
5	Animal Rendering	**73**	14	21	17	21
6	Animal Carcass	**10**	2	3	2	3
7	Sani waste	**56**	10	16	13	16
8	Domestic hazardous (Segregation & Transportation)	**81**	15	23	19	24
9	Saleable Recyclables	**696**	130	200	162	204
		6667	**1483**	**1410**	**1739**	**2034**

The Following below are the facilities required with respect to the ISWM Facilities for this project

1. Security Cabin at the Entry of Facility.
2. Weighing Bridge Plaza.
3. Tipping Floor.
4. RDF Processing Units.
5. Waste to Energy Plant
6. Bio Methanation Plant
7. Material Recycling Facility.
8. Leachate Treatment Plant (Requirement to be assessed by the Concessnaire).
9. Sanitary Landfill
10. Laboratory.
11. Green Belt
12. Admin Building.
13. Research and Development Block

14. Supporting infrastructure such as Roads, Compound Wall and Landscaping.
15. Vehicle Work Shop with Wash Area.
16. Stores

Firstly, the total population served is approximately 14.7 million people. On a per capita basis, including bulk waste, the average amount generated is 550 grams/day/capita.

The total quantity of waste generated per day, excluding road sweeping waste, is 8096 tons per day (TPD). This quantity is then broken down into different categories for assessment and processing.

Among the categorized waste streams

- Sanitary waste amounts to 81 TPD (1%)
- Animal waste from shops (Meat waste) is also 81 TPD (1%)
- Animal carcasses contribute 10 TPD
- Domestic hazardous waste is 81 TPD (1%)
- Stones, debris, and silt & inerts each amount to 81, 81, and 162 TPD respectively (1%, 1%, and 2% respectively)

After accounting for these specific waste streams, the balance available for processing stands at 7519 TPD. And from this balance following are the waste to be categorized in two fractions

- Derived dry waste after adjustments is 3481 TPD (43%)
- Derived wet waste after adjustments is 4048 TPD (50%)

Further assessment considered is:

- 5% of leachate, considered for Biomethanation (i.e. 405 TPD)

The balance quantities for processing are

- 3481 TPD of dry waste
- 3643 TPD of wet waste

Now the Existing commitments for waste management which are to be discounted from the estimated waste quantum includes:

- MSGP (Wet waste) at 900 TPD
- Bio Methanation plants (wet waste) at 105 TPD
- GAIL (wet waste) at 300 TPD
- Coconut (dry waste) at 313 TPD (9%)
- Recyclables (dry waste) at 696 TPD (20%)

- KPCL (Dry waste) at 600 TPD
- Inerts from RDF at 104 TPD (3%)

Therefore, the balance quantity now available (after discounting the existing commitments) for processing under a revenue generation model includes

- 2338 TPD for wet waste
- 1767 TPD for dry waste
- Additionally, street sweeping waste contributes 670 TPD, with 101 TPD being organic fraction (which is to be composted) and 570 TPD being silt for landfill.
- Finally, Inerts from Biomethanation amount to 142 TPD

The above mentioned quantities (2338 TPD) of wet waste and (1767 TPD) of Dry waste along with other waste like sanitary waste, Animal carcass waste and animal meat waste is to be considered for Processing at respective packages in the format shown below:

Sl.No	Particulars	Total	Package 1	Package 2	Package 3	Package 4
1	Bio Methanation	**2844**	532	819	661	832
2	WTE	**1767**	567	0	600	600
3	Landfill	**1140**	213	328	265	334
4	Leachate	**0**	0	0	0	0
5	Animal Rendering	**73**	14	21	17	21
6	Animal Carcass	**10**	2	3	2	3
7	Sani waste	**56**	10	16	13	16
8	Domestic Hazardeous(Segregation & Transportation)	**81**	15	23	19	24
9	Salable Recyclables	**696**	130	200	162	204
		6667	**1483**	**1410**	**1739**	**2034**

Note:- The Domestic Hazardous waste received at the processing facilities shall be transported to the Designated waste management plant (as notified by the authority) at the COST of Authority

The recommended components and process of technology available / establish in the processing facilities are indicated below.

a) Bio methanation: Bio methanation is a technology that utilizes mesophilic anaerobic digestion which leads to improved utilization of organic fractions of solid waste. The waste is processed based on the Maximum Yield Technology (MYT). It is a new treatment and utilization of residual household waste. MYT breaks down into four components, treats them according to their specific material, and extracts the maximum potential from them. Mechanical pre-treatment breaks the waste down automatically into individually defined fractions, according to the material of different sizes. The "biological step" ensures particularly efficient and stable process flows. Simple and robust aggregates guarantee maximum operational security at

simultaneously low investment and operational COSTs. Interim storage permits a flexible and consistent dosage of biological process steps. The targeted reproduction of microorganisms ensures a high level and constant biological activity. Then, the waste is selectively homogenized. After a short retention time in the mixer, presses dewater the solid material which is ideally prepared for biological drying. Microorganisms living in biogas fermenters generate biogas from organic compounds. At the end of the process, we get nutrient-rich water to be used as a liquid fertilizer in the agriculture industry.

Also, since the technology leads to the formation of Bio-CNG, fermented organic manure, and liquid digestate from source segregated organic fraction of solid waste, in comparison to organic compost from solid waste, in comparison to organic compost from the existing plants, there will be a significant additional reduction in carbon emission.

b) Composting: The solid waste material that results from the process of converting organic matter to biogas is further processed through composting. Aerobic Composting is the main technology used for this purpose. During the composting process, organic material from municipal solid waste is converted into a stable mass through aerobic decomposition. Aerobic microorganisms break down organic compounds into carbon dioxide and oxides of nitrogen and carbon, while nitrogen is recycled back into the process.

The composting module includes a concrete platform where windrow piling operations are carried out. The height of each windrow is limited to 2.5 meters to ensure effective aeration. During processing, the required temperature and moisture levels are maintained to ensure proper decomposition. A suitable microbial culture and treated leachate are applied for faster biodegradation. The waste is retained in the windrows for 4 weeks, during which the windrows are turned every week using specialized equipment called a Compost Turner.

After maturation and fermentation processes, the organic matter is separated from any remaining improper material through a process called compost refining. This process aims to obtain a cleaner product before it is sold. The trommel, which is fed through a belt conveyor, screens the material at 12mm. Any elements larger than 12mm are considered refuse and removed from the process.

c) Waste to Energy: Waste-to-energy incineration, also known as energy-from-waste, is a process that involves the combustion of municipal solid waste (MSW) or other types of waste materials to generate electricity and/or heat. It is a method of waste management that aims to recover energy from waste while reducing its volume and minimizing environmental impact. The waste is burned at high temperatures, typically ranging from 800 to 1,200 degrees Celsius (1,472 to 2,192 degrees Fahrenheit) as per CPCB norms. The combustion process converts the organic materials in the waste into heat. The heat generated during

combustion is used to produce steam in a boiler. The steam is then directed to a turbine, which drives a generator to produce electricity. The high-temperature flue gases produced from the combustion process are also used to generate steam or heat for various industrial processes or district heating systems. Waste-to-energy incineration i.e., mass- burn systems generally consist of either two or three incineration units with capacity ranges from 500 to 1,000 tons per day; thus, facility capacity ranges from about 1,500 to 3,000 tons per day. It involves combustion of unprocessed or minimally processed refuse. The major components of a mass burn facility include: (1) Refuse receiving, handling, and storage systems; (2) Combustion and steam generation system (a boiler); (3) Flue gas cleaning system; (4) Power generation equipment (steam turbine and generator); (5) Condenser cooling water system; and (6) Residue handling and storage system. The curtail components for waste-to-energy incineration system other the mechanism discussed above include

a. Air Pollution Control: To minimize air pollution, waste-to-energy facilities employ air pollution control systems. These systems include various technologies such as electrostatic precipitators, fabric filters, and selective catalytic reduction (SCR) systems. They help remove particulate matter, heavy metals, and other harmful pollutants from the flue gases before they are released into the atmosphere.
b. Residue Management: After the combustion process, the remaining solid ash, known as bottom ash, is collected. This ash may undergo additional treatment to remove any remaining metals before it is disposed of in an appropriate manner. Some waste-to-energy facilities also capture and treat the air pollution control residues, known as fly ash, to prevent the release of contaminants.
c. Environmental Monitoring: Waste-to-energy facilities are subject to strict environmental regulations. Regular monitoring is conducted to measure and ensure compliance with emission standards for air pollutants, such as particulate matter, heavy metals, and dioxins. Effluent from air pollution control systems, wastewater, and ash disposal sites are also monitored to assess their environmental impact.

Waste-to-energy incineration can be an effective waste management solution, as it reduces the volume of waste going to landfills, generates renewable energy, and contributes to the reduction of greenhouse gas emissions.

d) Sanitary Landfill: The modern sanitary landfill is considerably more than just a landfill or an open dump. This is because waste materials in the sanitary landfill are treated in a more controlled manner in order to protect the quality of groundwater in the vicinity. Lighter materials are deposited near the bottom of the sanitary landfill, where the majority of dangerous substances are buried, safeguarding the surrounding

ecosystem. Approximately 37% of waste is disposed of globally in a landfill, with 8% of that going to sanitary landfills with landfill gas collection systems.

The overall objective of the landfill will be to minimize the impacts on environment such as prevention of pollution of ground water, control of odour, restricting the generation of leachate through well controlled operational techniques. Performance standards for landfill operations are listed below and the same would be complied by us during the operations period.

e) Leachate Treatment Plant: Leachate Treatment Facility is to be installed so that leachate coming from the composting and processing facility is treated and Wastewater is reused. This treatment facility requires reducing the BOD and COD to the Permissible limits of SPCB or CPCB norms.

f) Other Auxiliary Functions: The indicative auxiliary functions for integrated solid waste treatment facility as per CPHEEO manual, which include

a) Security Rooms
b) Admin Building
c) Control Room
d) Laboratory
e) Stores
f) Canteen
g) Medical room
h) Employee change room.
i) Vehicle Tire / Washing Area.
j) Vehicle parking yard
k) Vehicle workshop
l) Fuel station.
m) Internal roads with storm water drainage

6 LIST OF ANNEXURES

Annexure -1

WARD WISE AREA, HOUSEHOLDS/COMMERCIAL ESTABLISHMENT AND WASTE QUANTITY DETAILS:

Sl. No.	WARD NAME	AREA (SQ. KM)	TOTAL HOUSEHOLDS (incl. slums) (non-bulk) (A)	TOTAL SMALL COMMERCIAL ESTABLISHMENTS (B)	TOTAL (A+B)	TOTAL WASTE QTY TPD
1	Kempegowda	10.9	13,700	1,307	15,007	28.84
2	Chowdeshwari	6.5	11,268	810	12,078	25.13
3	Attur	8.8	21,182	822	22,004	42.28
4	Yelahanka New Town	4.6	13,850	911	14,761	30.14
5	Jakkuru	23.5	17,257	991	18,248	33.17
6	Thanisandra	10	22,429	1,020	23,449	41.64
7	Byatarayanapura	10	23,281	1,293	24,574	43.80
8	Kodigehalli	3.8	16,196	1,185	17,381	31.73
9	Vidyaranyapura	9.9	18,878	376	19,254	33.32
10	Doddabommasandra	4.2	11,692	315	12,007	21.15
11	Kuvempungara	7.1	11,749	229	11,978	21.11
12	Shettihalli	8.1	18,074	1,697	19,771	37.84
13	Mallasandra	1.3	14,003	1,410	15,413	27.96
14	Bagalagunte	4.3	21,569	2,767	24,336	45.00
15	Dasarahalli	0.9	10,502	2,767	13,269	25.85
16	Jalahalli	5.2	9,270	275	9,545	18.32
17	J P Park	2	12,701	991	13,692	25.39
18	Radhakrishna Temple ward	1.9	9,691	381	10,072	17.78
19	Sanjaya Nagar	1.5	9,393	423	9,816	18.86
20	Ganga Nagar	2.3	8,029	367	8,396	14.71
21	Hebbala	1.2	9,091	537	9,628	17.38
22	Vishwanath Nagenahalli	1.5	16,185	1,152	17,337	31.27
23	Nagavara	2.1	14,247	529	14,776	26.82
24	HBR Layout	4.6	17,313	2,371	19,684	38.55
25	Horamavu	17.5	34,301	3,358	37,659	70.18
26	Ramamurthy Nagar	7.3	16,878	851	17,729	32.40
27	Banasavadi	3.4	14,884	1,067	15,951	28.86
28	Kammanahalli	1	13,442	634	14,076	24.95
29	Kacharkanahalli	1.7	13,878	1,714	15,592	29.48
30	Kadugondanahalli	0.7	11,365	912	12,277	21.18
31	Kushal Nagara	0.6	8,972	1,081	10,053	22.62
32	Kavalbyrasandra	1.6	10,148	488	10,636	18.98

Sl. No.	WARD NAME	AREA (SQ. KM)	TOTAL HOUSEHOLDS (incl. slums) (non-bulk) (A)	TOTAL SMALL COMMERCIAL ESTABLISHMENTS (B)	TOTAL (A+B)	TOTAL WASTE QTY TPD
33	Manorayanapalya	0.8	12,490	1,048	13,538	24.42
34	Gangenahalli	1.1	6,936	697	7,633	14.50
35	Aramane Nagara	7.5	10,024	1,100	11,124	21.00
36	Mattikere	0.5	11,014	1,584	12,598	25.18
37	Yeshwanthpura	0.8	12,596	604	13,200	23.15
38	HMT ward	5.2	9,092	967	10,059	18.34
39	Chokkasandra	3.8	19,992	927	20,919	36.39
40	Dodda Bidarakallu	12.9	38,724	2,468	41,192	74.65
41	Peenya Industrial Area	5.5	19,919	1,645	21,564	43.70
42	Lakshmi Devi Nagar	1.5	12,807	3,155	15,962	28.62
43	Nandini Layout	1.4	16,287	1,133	17,420	32.51
44	Marappana Palya	2	11,787	1,340	13,127	24.92
45	Malleswaram	1.8	8,610	1,346	9,956	24.99
46	Jayachamarajendra Nagar	0.9	8,281	1,140	9,421	17.89
47	DJ Halli	1.4	10,008	663	10,671	22.62
48	Muneshwaranagar	0.5	8,351	771	9,122	16.74
49	Lingarajapura	0.9	11,979	658	12,637	24.46
50	Benniganahalli	4.9	14,815	459	15,274	27.75
51	Vijnanapura	2.1	13,111	1,569	14,680	26.60
52	KRPura	4.8	16,330	302	16,632	19.25
53	Basavanapura	6.3	14,425	239	14,664	26.63
54	Hudi	15	27,000	1,348	28,348	26.08
55	Devasandra	3.5	10,597	249	10,846	18.82
56	A Narayanapura	2.1	15,838	1,121	16,959	24.94
57	C V Raman Nagar	3.6	17,326	1,920	19,246	35.21
58	New Tippasandara	3.4	13,247	779	14,026	24.94
59	Maruthi Seva Nagar	2.4	13,974	482	14,456	26.52
60	Sagayapuram	0.8	7,946	825	8,771	19.69
61	S.K.Garden	1.3	14,881	2,735	17,616	33.84
62	Ramaswamy Palya	0.8	8,898	1,271	10,169	19.62
63	Jayamahal	1.4	4,545	1,042	5,587	12.37
64	Rajmahalnagara	0.7	12,300	1,209	13,509	24.72
65	Kadu Malleshwara	1.4	16,903	1,358	18,261	39.35
66	Subramanya Nagara	0.9	12,300	349	12,649	21.83
67	Nagapura	1.8	10,621	2,580	13,201	25.61
68	Mahalakshimpuram	0.9	14,169	857	15,026	26.06
69	Laggere	1.6	18,609	575	19,184	31.30

Sl. No.	WARD NAME	AREA (SQ. KM)	TOTAL HOUSEHOLDS (incl. slums) (non-bulk) (A)	TOTAL SMALL COMMERCIAL ESTABLISHMENTS (B)	TOTAL (A+B)	TOTAL WASTE QTY TPD
70	Rajagopal Nagar	2.2	21,954	795	22,749	41.58
71	Hegganahalli	1.8	21,615	1,070	22,685	43.14
72	Herohalli	7.8	32,065	899	32,964	55.06
73	Kottegepalya	5.8	15,019	844	15,863	27.56
74	Shakthi Ganapathi Nagar	0.7	13,570	940	14,510	26.85
75	Shankar Matt	1.1	15,235	1,013	16,248	28.47
76	Gayathrinagara	0.6	11,200	527	11,727	20.86
77	Dattatreya Temple	0.7	15,814	1,950	17,764	25.38
78	Pulkeshinagar	1.7	6,929	1,969	8,898	17.48
79	Sarvagnanagara	3.6	11,651	465	12,116	21.67
80	Hoysala Nagar	2.1	12,610	2,256	14,866	28.47
81	Vijnana Nagar	5.7	24,732	866	25,598	13.85
82	Garudachar Playa	6.8	25,988	1,618	27,606	29.61
83	Kadugodi	11.2	20,471	384	20,855	26.16
84	Hagadur	12.6	23,971	699	24,670	31.25
85	Dodda Nekkundi	12	35,536	1,364	36,900	30.60
86	Marathahalli	3.1	26,500	1,272	27,772	27.81
87	HAL Airport ward	6.8	12,014	261	12,275	21.67
88	Jeevanbhima Nagar	1.9	11,745	1,438	13,183	24.57
89	Jogupalya	0.9	10,673	329	11,002	19.07
90	Halasuru	1.7	7,800	3,701	11,501	24.41
91	Bharathinagar	0.8	10,577	6,997	17,574	36.29
92	Shivajinagar	0.4	10,577	6,969	17,546	36.09
93	Vasanth Nagar	3.1	5,560	1,264	6,824	14.73
94	Gandhinagara	1.9	16,960	16,000	32,960	14.82
95	Subhashnagar	1.3	17,698	665	18,363	23.91
96	Okalipura	0.8	18,005	2,198	20,203	22.95
97	Dayanandnagar	0.4	14,950	1,203	16,153	32.45
98	Prakashnagara	0.6	14,700	512	15,212	26.42
99	Rajajinagar	0.9	14,589	1,041	15,630	28.13
100	Basaveshwaranagar	0.8	17,692	812	18,504	33.54
101	Kamakshipalya	0.9	9,041	1,050	10,091	19.67
102	Vrisabhavathi	1	16,367	744	17,111	29.69
103	Kaveripura	1.7	17,563	1,878	19,441	36.37
104	Govindaraja Nagar	0.8	8,455	732	9,187	16.74
105	Agrahara Dasarahalli	0.8	8,459	606	9,065	16.15

Sl. No.	WARD NAME	AREA (SQ. KM)	TOTAL HOUSEHOLDS (incl. slums) (non-bulk) (A)	TOTAL SMALL COMMERCIAL ESTABLISHMENTS (B)	TOTAL (A+B)	TOTAL WASTE QTY TPD
106	Dr. Raj Kumar Ward	1	7,575	1,208	8,783	19.32
107	Shivanagara	0.8	11,189	681	11,870	22.65
108	Sriramamandira	1.1	16,920	1,203	18,123	35.23
109	Chickpet	0.7	9,258	45,000	54,258	177.78
110	Sampangiramanagar	4.4	7,779	3,734	11,513	27.71
111	Shanthala Nagar	4	5,600	4,640	10,240	31.50
112	Domlur	1.7	8,498	792	9,290	17.75
113	Konena Agrahara	2.1	10,391	1,011	11,402	20.51
114	Agaram	11	8,563	466	9,029	16.83
115	Vannarpet	0.8	11,080	488	11,568	20.89
116	Neelasandra	0.5	14,900	273	15,173	27.07
117	Shanthi Nagar	2.7	10,772	698	11,470	21.92
118	Sudham Nagar	1	7,441	2,700	10,141	23.10
119	Dharmarayaswamy	1.1	6,856	16,414	23,270	105.48
120	Cottonpet	0.8	17,125	7,706	24,831	33.11
121	Binnypet	0.8	14,684	2,741	17,425	27.50
122	K.P.Aghara	0.4	12,094	326	12,420	21.76
123	Vijayanagara	0.7	11,811	419	12,230	21.93
124	Hosahalli	0.9	10,411	579	10,990	20.00
125	Marenahalli	0.7	7,935	557	8,492	14.97
126	Maruthi Mandir ward	0.8	9,617	356	9,973	17.32
127	Mudalapalya	1	13,866	521	14,387	25.02
128	Nagarabhavi	1.6	10,289	416	10,705	18.64
129	Jnana Bharathi ward	11.9	21,419	996	22,415	40.65
130	Ullalu	8.7	27,922	748	28,670	47.74
131	Nayandahalli	2.1	12,519	903	13,422	27.46
132	Attiguppe	1.4	11,635	412	12,047	21.49
133	Hampi Nagar	1.1	10,219	448	10,667	18.79
134	Bapujinagara	0.7	12,970	1,105	14,075	24.88
135	Padarayanapura	0.3	5,988	440	6,428	12.56
136	JJR Nagar	0.6	10,262	602	10,864	21.12
137	Rayapuram	0.4	9,099	1,144	10,243	23.14
138	Chalavadi Palya	0.4	5,901	411	6,312	13.08
139	SKR Market	0.8	14,162	6,324	20,486	40.79
140	Chamarajpet	1	9,040	1,452	10,492	19.47
141	Azadnagar	0.7	11,144	213	11,357	19.42

Sl. No.	WARD NAME	AREA (SQ. KM)	TOTAL HOUSEHOLDS (incl. slums) (non-bulk) (A)	TOTAL SMALL COMMERCIAL ESTABLISHMENTS (B)	TOTAL (A+B)	TOTAL WASTE QTY TPD
142	Sunkenahalli	1.5	10,803	763	11,566	22.35
143	V.V.Puram	2.5	9,201	1,850	11,051	21.28
144	Siddapura	0.7	9,035	530	9,565	19.02
145	Hombegowdanagara	1.4	11,112	735	11,847	21.66
146	Lakkasandra	1.3	9,850	238	10,088	17.52
147	Adugodi	1.6	9,085	164	9,249	17.20
148	Ejipura	1.9	11,771	164	11,935	20.92
149	Varthuru	28.3	26,359	755	27,114	27.46
150	Bellanduru	26.4	40,652	2,968	43,620	65.78
151	Koramangala	3.7	11,513	1,084	12,597	27.46
152	Sudduguntepalya	1.7	13,887	1,044	14,931	26.72
153	Jayanagar 1st and 2nd Block	2.5	9,615	735	10,350	18.99
154	Basavanagudi	1.2	11,367	2,401	13,768	26.15
155	Hanumanth Nagar	1	12,500	1,655	14,155	25.08
156	Srinagar	0.8	13,937	1,046	14,983	26.11
157	Gali Anjenaya Temple ward	1.1	10,305	597	10,902	20.86
158	Deepanjali Nagar	2.1	13,660	670	14,330	26.88
159	Kengeri	5.1	25,767	194	25,961	12.59
160	Rajarajeshwari Nagar	11.1	16,652	1,086	17,738	30.46
161	Hosakerehalli	1.3	14,588	2,920	17,508	34.97
162	Girinagar	1.8	14,736	973	15,709	27.25
163	Katriguppe	1.1	15,615	760	16,375	28.69
164	Vidyapeeta ward	1.2	15,029	1,550	16,579	29.80
165	Ganesh Mandir ward	1.6	7,365	912	8,277	16.38
166	Karisandra	1.1	7,400	761	8,161	18.46
167	Yediyur	1.2	9,612	1,325	10,937	22.39
168	Pattabhiramanagar	1.7	12,801	1,933	14,734	27.24
169	Byrasandra	0.9	8,674	2,353	11,027	21.35
170	Jayanagar East	1	9,191	767	9,958	18.56
171	Gurappanapalya	0.7	12,183	1,069	13,252	23.00
172	Madivala	1.2	14,815	950	15,765	28.53
173	Jakkasandra	1.5	10,012	216	10,228	17.47
174	HSR Layout	7.1	26,000	2,570	28,570	34.55
175	Bommanahalli	1.8	16,075	1,363	17,438	31.15
176	BTM Layout	1.1	18,466	1,085	19,551	34.69
177	J P Nagar	1.8	8,860	655	9,515	17.19

Sl. No.	WARD NAME	AREA (SQ. KM)	TOTAL HOUSEHOLDS (incl. slums) (non-bulk) (A)	TOTAL SMALL COMMERCIAL ESTABLISHMENTS (B)	TOTAL (A+B)	TOTAL WASTE QTY TPD
178	Sarakki	1.3	8,900	655	9,555	17.26
179	Shakambari Nagar	1.9	6,985	682	7,667	14.40
180	Banashankari Temple	0.7	10,799	1,562	12,361	25.97
181	Kumaraswamy Layout	1.8	13,472	1,182	14,654	28.02
182	Padmanabha Nagar	1.7	11,717	831	12,548	23.36
183	Chikkalsandra	1.1	13,181	2,168	15,349	32.40
184	Uttarahalli	9.9	19,282	360	19,642	35.05
185	Yelchenahalli	1.6	13,396	322	13,718	23.80
186	Jaraganahalli	1.3	11,396	169	11,565	19.42
187	Puttenahalli	2.9	14,330	297	14,627	24.79
188	Bilekahalli	4.3	12,160	310	12,470	22.05
189	Hongasandra	2.1	22,157	786	22,943	41.12
190	Mangammanapalya	3.5	18,541	235	18,776	32.62
191	Singasandra	9.7	23,220	673	23,893	44.03
192	Begur	19	26,560	692	27,252	49.71
193	Arakere	6.6	16,238	613	16,851	30.10
194	Gottigere	7.4	17,314	641	17,955	33.13
195	Konankunte	3.4	13,529	581	14,110	24.49
196	Anjanapura	11.4	12,369	503	12,872	23.54
197	Vasanthpura	5.7	23,430	390	23,820	41.83
198	Hemmigepura	30.5	19,886	277	20,163	32.87
	Total	**708**	**27,94,724**	**3,07,774**	**31,02,498**	**5,530.06**

Source: BBMP SWM Cell

Annexure 2

List of Ward Wise Auto Tippers Engaged by Private Players

Ward No.	WARD NAME	NO. OF AUTO TIPPERS (1 per block; daily collection)	Extra AUTO for MARKETS / LEAF LITTER / SLUM / HIGH PROFILE AREAS	TOTAL NO. OF AUTOS REQUIRED (1 per 1750 units; bi-weekly collection)	EXTRA AUTOs for COMMERCIAL Night Collection	TOTAL
1	Kempegowda	18		3		21
2	Chowdeshwari	15		2		17
3	Attur	29		4		33
4	Yelahanka New Town	21		3		24
5	Jakkuru	26		3		29
6	Thanisandra	27		4		31
7	Byatarayanapura	25		5		30
8	Kodigehalli	13		3		16
9	Vidyaranyapura	26		4		30
10	Doddabommasandra	14		2		16
11	Kuvempungara	12		2		14
12	Shettihalli	29		4		33
13	Mallasandra	21		3		24
14	Bagalagunte	30		4		34
15	Dasarahalli	19		3		22
16	Jalahalli	14		2		16
17	J P Park	21		3		24
18	Radhakrishna Temple ward	15		2		17
19	Sanjaya Nagar	13		2		15
20	Ganga Nagar	13		2		15
21	Hebbala	12		2		14
22	Vishwanath Nagenahalli	22		3		25
23	Nagavara	20		3		23
24	HBR Layout	23		4		27

Ward No.	WARD NAME	NO. OF AUTO TIPPERS (1 per block; daily collection)	Extra AUTO for MARKETS / LEAF LITTER / SLUM / HIGH PROFILE AREAS	TOTAL NO. OF AUTOS REQUIRED (1 per 1750 units; bi-weekly collection)	EXTRA AUTOs for COMMERCIAL Night Collection	TOTAL
25	Horamavu	50		7		57
26	Ramamurthy Nagar	23		3		26
27	Banasavadi	20		3		23
28	Kammanahalli	17		3		20
29	Kacharkanahalli	20		3		23
30	Kadugondanahalli	15		3		18
31	Kushal Nagara	12		2		14
32	Kavalbyrasandra	14		2		16
33	Manorayanapalya	17		3		20
34	Gangenahalli	12		2		14
35	Aramane Nagara	14	1	2		17
36	Mattikere	14		3		17
37	Yeshwanthpura	17	1	3		21
38	HMT ward	19		2		21
39	Chokkasandra	28		4		32
40	Dodda Bidarakallu	52		7		59
41	Peenya Industrial Area	30		4		34
42	Lakshmi Devi Nagar	18		3		21
43	Nandini Layout	22		3		25
44	Marappana Palya	18		3		21
45	Malleswaram	13		2		15
46	Jayachamarajendra Nagar	11		2		13
47	DJ Halli	15		2		17
48	Muneshwaranagar	11		2		13
49	Lingarajapura	17		3		20
50	Benniganahalli	18		3		21

Ward No.	WARD NAME	NO. OF AUTO TIPPERS (1 per block; daily collection)	Extra AUTO for MARKETS / LEAF LITTER / SLUM / HIGH PROFILE AREAS	TOTAL NO. OF AUTOS REQUIRED (1 per 1750 units; bi-weekly collection)	EXTRA AUTOs for COMMERCIAL Night Collection	TOTAL
51	Vijnanapura	25		3		28
52	KRPura	14		3		17
53	Basavanapura	20		3		23
54	Hudi	23		5		28
55	Devasandra	14		2		16
56	A Narayanapura	20		3		23
57	C V Raman Nagar	25		4		29
58	New Tippasandara	18		3		21
59	Maruthi Seva Nagar	19		3		22
60	Sagayapuram	11		2		13
61	S.K.Garden	15		3		18
62	Ramaswamy Palya	14		2		16
63	Jayamahal	10		1		11
64	Rajmahalnagara	20		3		23
65	Kadu Malleshwara	24	1	3		28
66	Subramanya Nagara	18		3		21
67	Nagapura	17	1	3		21
68	Mahalakshimpuram	19		3		22
69	Laggere	25		4		29
70	Rajagopal Nagar	31		4		35
71	Hegganahalli	34		4		38
72	Herohalli	43		6		49
73	Kottegepalya	30		3		33
74	Shakthi Ganapathi Nagar	18		3		21
75	Shankar Matt	19		3		22
76	Gayathrinagara	15	1	2		18

Ward No.	WARD NAME	NO. OF AUTO TIPPERS (1 per block; daily collection)	Extra AUTO for MARKETS / LEAF LITTER / SLUM / HIGH PROFILE AREAS	TOTAL NO. OF AUTOS REQUIRED (1 per 1750 units; bi-weekly collection)	EXTRA AUTOs for COMMERCIAL Night Collection	TOTAL
77	Dattatreya Temple	20	1	3		24
78	Pulkeshinagar	10		2		12
79	Sarvagnanagara	15		2		17
80	Hoysala Nagar	18		3		21
81	Vijnana Nagar	33		5		38
82	Garudachar Playa	35		5		40
83	Kadugodi	27		4		31
84	Hagadur	24		5		29
85	Dodda Nekkundi	21		7		28
86	Marathahalli	35	1	5		41
87	HAL Airport ward	16		3		19
88	Jeevanbhima Nagar	16		3		19
89	Jogupalya	15		2		17
90	Halasuru	14		2		16
91	Bharathinagar	15		3		18
92	Shivajinagar	14		3		17
93	Vasanth Nagar	11	3	2		16
94	Gandhinagara	22		6		28
95	Subhashnagar	18		3		21
96	Okalipura	18		4		22
97	Dayanandnagar	20		3		23
98	Prakashnagara	19		3		22
99	Rajajinagar	20		3		23
100	Basaveshwaranagar	22		4		26
101	Kamakshipalya	16		2		18
102	Vrisabhavathi	19		3		22

Ward No.	WARD NAME	NO. OF AUTO TIPPERS (1 per block; daily collection)	Extra AUTO for MARKETS / LEAF LITTER / SLUM / HIGH PROFILE AREAS	TOTAL NO. OF AUTOS REQUIRED (1 per 1750 units; bi-weekly collection)	EXTRA AUTOs for COMMERCIAL Night Collection	TOTAL
103	Kaveripura	22		4		26
104	Govindaraja Nagar	12		2		14
105	Agrahara Dasarahalli	14		2		16
106	Dr. Raj Kumar Ward	11		2		13
107	Shivanagara	15		2		17
108	Sriramamandira	25		3		28
109	Chickpet	32		9		41
110	Sampangiramanagar	27		2		29
111	Shanthala Nagar	11		2		13
112	Domlur	14		2		16
113	Konena Agrahara	16		2		18
114	Agaram	12		2		14
115	Vannarpet	15		2		17
116	Neelasandra	20		3		23
117	Shanthi Nagar	14		2		16
118	Sudham Nagar	17		2		19
119	Dharmarayaswamy	30		4		34
120	Cottonpet	20		5	1	26
121	Binnypet	19		3	1	23
122	K.P.Aghara	19		3		22
123	Vijayanagara	19		2		21
124	Hosahalli	17	1	2		20
125	Marenahalli	11		2		13
126	Maruthi Mandir ward	12		2		14
127	Mudalapalya	18		3		21
128	Nagarabhavi	14		2		16

Ward No.	WARD NAME	NO. OF AUTO TIPPERS (1 per block; daily collection)	Extra AUTO for MARKETS / LEAF LITTER / SLUM / HIGH PROFILE AREAS	TOTAL NO. OF AUTOS REQUIRED (1 per 1750 units; bi-weekly collection)	EXTRA AUTOs for COMMERCIAL Night Collection	TOTAL
129	Jnana Bharathi ward	39		4		43
130	Ullalu	38		5		43
131	Nayandahalli	16		3		19
132	Attiguppe	17	1	2		20
133	Hampi Nagar	16		2		18
134	Bapujinagara	17		3		20
135	Padarayanapura	12		2		14
136	JJR Nagar	15		2		17
137	Rayapuram	16		2		18
138	Chalavadi Palya	15		2		17
139	SKR Market	16	20	4		40
140	Chamarajpet	19		2	1	22
141	Azadnagar	18		2		20
142	Sunkenahalli	18	2	2		22
143	V.V.Puram	15	1	2		18
144	Siddapura	20	1	2		23
145	Hombegowdanagara	19	1	2		22
146	Lakkasandra	15		2		17
147	Adugodi	15		2		17
148	Ejipura	22		2		24
149	Varthuru	26		5		31
150	Bellanduru	54		4		58
151	Koramangala	29	2	3		34
152	Sudduguntepalya	25		3		28
153	Jayanagar 1st and 2nd Block	21	1	2		24
154	Basavanagudi	22		3		25

Ward No.	WARD NAME	NO. OF AUTO TIPPERS (1 per block; daily collection)	Extra AUTO for MARKETS / LEAF LITTER / SLUM / HIGH PROFILE AREAS	TOTAL NO. OF AUTOS REQUIRED (1 per 1750 units; bi-weekly collection)	EXTRA AUTOs for COMMERCIAL Night Collection	TOTAL
155	Hanumanth Nagar	26		3		29
156	Srinagar	22		3		25
157	Gali Anjenaya Temple ward	18		2		20
158	Deepanjali Nagar	23		3		26
159	Kengeri	27		5		32
160	Rajarajeshwari Nagar	35		3		38
161	Hosakerehalli	20		3		23
162	Girinagar	21		3		24
163	Katriguppe	22		3		25
164	Vidyapeeta ward	23		3		26
165	Ganesh Mandir ward	20		2		22
166	Karisandra	20		2		22
167	Yediyur	16		2		18
168	Pattabhiramanagar	18		3		21
169	Byrasandra	13		2		15
170	Jayanagar East	16		2		18
171	Gurappanapalya	20		3		23
172	Madivala	23	1	3		27
173	Jakkasandra	14		2		16
174	HSR Layout	27		5	1	33
175	Bommanahalli	20		3		23
176	BTM Layout	26		4		30
177	J P Nagar	17		2		19
178	Sarakki	17		2		19
179	Shakambari Nagar	14		2		16
180	Banashankari Temple	36		3		39

Ward No.	WARD NAME	NO. OF AUTO TIPPERS (1 per block; daily collection)	Extra AUTO for MARKETS / LEAF LITTER / SLUM / HIGH PROFILE AREAS	TOTAL NO. OF AUTOS REQUIRED (1 per 1750 units; bi-weekly collection)	EXTRA AUTOs for COMMERCIAL Night Collection	TOTAL
181	Kumaraswamy Layout	23		3		26
182	Padmanabha Nagar	21		3		24
183	Chikkalsandra	19		3		22
184	Uttarahalli	27		4		31
185	Yelchenahalli	19		3		22
186	Jaraganahalli	18		2		20
187	Puttenahalli	18		3		21
188	Bilekahalli	21		3		24
189	Hongasandra	29		4		33
190	Mangammanapalya	28		4		32
191	Singasandra	40		4		44
192	Begur	36		5		41
193	Arakere	23		3		26
194	Gottigere	23		3		26
195	Konankunte	21		3		24
196	Anjanapura	25		3		28
197	Vasanthpura	28		4		32
198	Hemmigepura	51		4		55
	Total	**4084**	**41**	**596**	**4**	**4725**

Source: BBMP SWM Cell

Annexure 3

List of Services Level benchmarks of Private Players for Collection & Transportation to be adhered addition/Along with to the service level bench marks indicated in DCA

Sl. No.	Component	Activity	Process	Frequency
1	**Primary Collection**	Collection of segregated wet waste and sanitary waste from waste generators other than Bulk Generators	Door-to-door collection from households (including slums) and Small Commercial Establishments (SCEs) not categorized under Bulk Generator. Auto-tippers to be deployed.	Daily
1.(i)	Wet Waste	Door-to-door collection of segregated wet waste	Using specified vehicle type, collect only segregated wet & sanitary waste. Kitchen waste must be collected separately. Non-segregated waste shall not be collected.	Daily
1.ii	Sanitary Waste	Door-to-door collection of Sanitary Waste	Collected along with wet waste, in separate bags. Marked with a cross. Record of quantity transferred daily.	Daily
2	**Street Sweeping Waste Collection**	Roads, footpaths, flyovers, and subways	Collection of sweeping waste by primary collection vehicle. Collection shall commence not later than 11:00 AM and be completed by 2:00 PM.	Daily
2.(i)	Street Sweeping - Second Shift / Night shift	Wherever applicable	Collection and transportation of street sweeping waste from the second shift/night shift.	Daily
2.(ii)	Street Sweeping	Playgrounds, burial grounds, parks, public toilets, and urinals	Clearing litter collected around these places. Segregation and disposal as specified.	Daily

Sl. No.	Component	Activity	Process	Frequency
2.iv	Street Sweeping	Vacant Sites	Shifting waste from vacant sites upon identification and request by the Authority.	As and when identified and on request
2.v	Clearing of Litter Bins	-	Removal of waste from litter bins with zero spillage.	Daily
2.vi	Clearing of Garbage Vulnerable Points		Clearing all Garbage Vulnerable Points and maintaining cleanliness till the next shift.	Daily
2.vii	**Grievance Redressal**		Addressing complaints received through various channels and maintaining a log.	Daily
3	**Secondary Transportation**	Segregated Wet Waste from Households and SCEs	Transfer to Designated Location for Wet Waste Disposal using Compactors.	Daily
4	Green Waste (Dry Leaves and Tree Cuttings)		Transport to Designated Location for Green Waste Disposal.	Daily
5	Street Sweeping Waste and Inerts from all sources		Disposal at Designated Location.	Daily
8	Transportation of Waste	-	Transporting all waste in a segregated, hygienic manner without any spillage.	Daily
B	Vehicles and Equipment			
B.1	Primary Collection and Secondary Transportation	Deployment of vehicles as per schedule. Registration, RFID/GPS integration, and	As directed by the Manufacturer	

Sl. No.	Component	Activity	Process	Frequency
		attendance through BBMP's mobile app.		
B.2	Vehicle Maintenance	Responsibility for maintenance of all vehicles, owned or hired.	Periodic as per Schedule 10 or manufacturer's directions	
B.3	Parking	Identification of location for parking of vehicles.	-	
B.4	Equipment/Tools/Consumables	Provision and maintenance as per schedule.	Periodic as per Schedule 10 or manufacturer's directions	
B.5	Repair Reserve/Spare Vehicles	Availability of reserve vehicles to avoid any shortfall.	-	
C	Personnel			
C.1	Salaries and Benefits	Payment of personnel as per industry standards, including PF and ESI.		Monthly
C.2	Attendance	Maintenance of daily attendance register and submission of digital log details.		Daily
C.3	Facilities	Provision of facilities for service personnel as per statutory requirements.	-	

Sl. No.	Component	Activity	Process	Frequency
C.4	Uniforms and Safety Gears	Provision of uniforms and safety gears for all personnel.	-	

Annexure 4

List of Refuse Compactors Engaged by Private Players

Ward No.	WARD NAME	WET Waste Compactor (10 Tonnes)	Reject + Mixed Waste Compactor (10 Tonnes)	TOTAL COMPACTORS (10 Tonnes)
1	Kempegowda	2	1	**3**
2	Chowdeshwari	1	1	**2**
3	Attur	2	1	**3**
4	Yelahanka New Town	2	1	**3**
5	Jakkuru	2	1	**3**
6	Thanisandra	2	1	**3**
7	Byatarayanapura	2	1	**3**
8	Kodigehalli	2	1	**3**
9	Vidyaranyapura	2	1	**3**
10	Doddabommasandra	1	1	**2**
11	Kuvempungara	1	1	**2**
12	Shettihalli	2	1	**3**
13	Mallasandra	2	1	**3**
14	Bagalagunte	2	1	**3**
15	Dasarahalli	1	1	**2**
16	Jalahalli	1	1	**2**
17	J P Park	1	1	**2**
18	Radhakrishna Temple ward	2	1	**3**
19	Sanjaya Nagar	1	1	**2**
20	Ganga Nagar	1	1	**2**
21	Hebbala	1	1	**2**
22	Vishwanath Nagenahalli	2	1	**3**
23	Nagavara	2	1	**3**
24	HBR Layout	2	2	**4**

Ward No.	WARD NAME	WET Waste Compactor (10 Tonnes)	Reject + Mixed Waste Compactor (10 Tonnes)	TOTAL COMPACTORS (10 Tonnes)
25	Horamavu	3	2	**5**
26	Ramamurthy Nagar	2	1	**3**
27	Banasavadi	2	1	**3**
28	Kammanahalli	2	1	**3**
29	Kacharkanahalli	2	1	**3**
30	Kadugondanahalli	1	2	**3**
31	Kushal Nagara	1	1	**2**
32	Kavalbyrasandra	1	1	**2**
33	Manorayanapalya	2	1	**3**
34	Gangenahalli	1	1	**2**
35	Aramane Nagara	2	1	**3**
36	Mattikere	1	1	**2**
37	Yeshwanthpura	2	1	**3**
38	HMT ward	1	1	**2**
39	Chokkasandra	2	1	**3**
40	Dodda Bidarakallu	2	2	**4**
41	Peenya Industrial Area	2	1	**3**
42	Lakshmi Devi Nagar	2	1	**3**
43	Nandini Layout	2	1	**3**
44	Marappana Palya	2	1	**3**
45	Malleswaram	1	1	**2**
46	Jayachamarajendra Nagar	1	1	**2**
47	DJ Halli	1	2	**3**
48	Muneshwaranagar	1	2	**3**
49	Lingarajapura	2	1	**3**
50	Benniganahalli	2	1	**3**
51	Vijnanapura	1	1	**2**
52	KRPura	1	1	**2**

Ward No.	WARD NAME	WET Waste Compactor (10 Tonnes)	Reject + Mixed Waste Compactor (10 Tonnes)	TOTAL COMPACTORS (10 Tonnes)
53	Basavanapura	1	1	**2**
54	Hudi	2	1	**3**
55	Devasandra	1	1	**2**
56	A Narayanapura	1	1	**2**
57	C V Raman Nagar	2	1	**3**
58	New Tippasandara	1	1	**2**
59	Maruthi Seva Nagar	2	1	**3**
60	Sagayapuram	1	1	**2**
61	S.K.Garden	1	2	**3**
62	Ramaswamy Palya	1	1	**2**
63	Jayamahal	1	1	**2**
64	Rajmahalnagara	1	1	**2**
65	Kadu Malleshwara	2	1	**3**
66	Subramanya Nagara	1	1	**2**
67	Nagapura	2	1	**3**
68	Mahalakshimpuram	1	1	**2**
69	Laggere	2	1	**3**
70	Rajagopal Nagar	2	1	**3**
71	Hegganahalli	2	1	**3**
72	Herohalli	2	2	**4**
73	Kottegepalya	2	1	**3**
74	Shakthi Ganapathi Nagar	1	1	**2**
75	Shankar Matt	1	1	**2**
76	Gayathrinagara	1	1	**2**
77	Dattatreya Temple	1	1	**2**
78	Pulkeshinagar	1	1	**2**
79	Sarvagnanagara	2	1	**3**
80	Hoysala Nagar	2	1	**3**

Ward No.	WARD NAME	WET Waste Compactor (10 Tonnes)	Reject + Mixed Waste Compactor (10 Tonnes)	TOTAL COMPACTORS (10 Tonnes)
81	Vijnana Nagar	2	1	**3**
82	Garudachar Playa	2	1	**3**
83	Kadugodi	2	1	**3**
84	Hagadur	2	1	**3**
85	Dodda Nekkundi	3	1	**4**
86	Marathahalli	2	1	**3**
87	HAL Airport ward	1	1	**2**
88	Jeevanbhima Nagar	2	1	**3**
89	Jogupalya	1	1	**2**
90	Halasuru	1	1	**2**
91	Bharathinagar	2	2	**4**
92	Shivajinagar	2	2	**4**
93	Vasanth Nagar	1	1	**2**
94	Gandhinagara	1	1	**2**
95	Subhashnagar	1	1	**2**
96	Okalipura	1	1	**2**
97	Dayanandnagar	2	1	**3**
98	Prakashnagara	1	1	**2**
99	Rajajinagar	1	1	**2**
100	Basaveshwaranagar	2	1	**3**
101	Kamakshipalya	1	1	**2**
102	Vrisabhavathi	1	1	**2**
103	Kaveripura	2	1	**3**
104	Govindaraja Nagar	1	1	**2**
105	Agrahara Dasarahalli	1	1	**2**
106	Dr. Raj Kumar Ward	1	1	**2**
107	Shivanagara	1	1	**2**
108	Sriramamandira	2	1	**3**

Ward No.	WARD NAME	WET Waste Compactor (10 Tonnes)	Reject + Mixed Waste Compactor (10 Tonnes)	TOTAL COMPACTORS (10 Tonnes)
109	Chickpet	3	2	**5**
110	Sampangiramanagar	2	1	**4**
111	Shanthala Nagar	1	2	**3**
112	Domlur	1	1	**2**
113	Konena Agrahara	1	2	**3**
114	Agaram	1	1	**2**
115	Vannarpet	1	1	**2**
116	Neelasandra	2	1	**3**
117	Shanthi Nagar	1	1	**2**
118	Sudham Nagar	1	1	**2**
119	Dharmarayaswamy	4	3	**7**
120	Cottonpet	1	2	**3**
121	Binnypet	1	1	**2**
122	K.P.Aghara	1	1	**2**
123	Vijayanagara	2	1	**3**
124	Hosahalli	1	1	**2**
125	Marenahalli	1	1	**2**
126	Maruthi Mandir ward	1	1	**2**
127	Mudalapalya	2	1	**3**
128	Nagarabhavi	1	1	**2**
129	Jnana Bharathi ward	2	2	**4**
130	Ullalu	2	1	**3**
131	Nayandahalli	2	1	**3**
132	Attiguppe	1	1	**2**
133	Hampi Nagar	1	1	**2**
134	Bapujinagara	2	1	**3**
135	Padarayanapura	1	1	**2**
136	JJR Nagar	1	1	**2**

Ward No.	WARD NAME	WET Waste Compactor (10 Tonnes)	Reject + Mixed Waste Compactor (10 Tonnes)	TOTAL COMPACTORS (10 Tonnes)
137	Rayapuram	1	1	**2**
138	Chalavadi Palya	1	1	**2**
139	SKR Market	7	2	**9**
140	Chamarajpet	2	1	**3**
141	Azadnagar	1	1	**2**
142	Sunkenahalli	3	1	**4**
143	V.V.Puram	2	1	**3**
144	Siddapura	1	1	**2**
145	Hombegowdanagara	2	1	**3**
146	Lakkasandra	1	1	**2**
147	Adugodi	1	1	**2**
148	Ejipura	2	1	**3**
149	Varthuru	2	1	**3**
150	Bellanduru	3	3	**6**
151	Koramangala	4	1	**5**
152	Sudduguntepalya	2	1	**3**
153	Jayanagar 1st and 2nd Block	2	1	**3**
154	Basavanagudi	2	1	**3**
155	Hanumanth Nagar	1	1	**2**
156	Srinagar	1	1	**2**
157	Gali Anjenaya Temple ward	1	1	**2**
158	Deepanjali Nagar	2	1	**3**
159	Kengeri	1	1	**2**
160	Rajarajeshwari Nagar	2	1	**3**
161	Hosakerehalli	2	1	**3**
162	Girinagar	2	1	**3**
163	Katriguppe	2	1	**3**

Ward No.	WARD NAME	WET Waste Compactor (10 Tonnes)	Reject + Mixed Waste Compactor (10 Tonnes)	TOTAL COMPACTORS (10 Tonnes)
164	Vidyapeeta ward	2	1	**3**
165	Ganesh Mandir ward	1	1	**2**
166	Karisandra	2	1	**3**
167	Yediyur	2	1	**3**
168	Pattabhiramanagar	2	1	**3**
169	Byrasandra	1	1	**2**
170	Jayanagar East	1	1	**2**
171	Gurappanapalya	2	1	**3**
172	Madivala	2	1	**3**
173	Jakkasandra	1	1	**2**
174	HSR Layout	3	1	**4**
175	Bommanahalli	2	1	**3**
176	BTM Layout	2	1	**3**
177	J P Nagar	1	1	**2**
178	Sarakki	1	1	**2**
179	Shakambari Nagar	1	1	**2**
180	Banashankari Temple	3	1	**4**
181	Kumaraswamy Layout	2	1	**3**
182	Padmanabha Nagar	2	1	**3**
183	Chikkalsandra	2	1	**3**
184	Uttarahalli	2	1	**3**
185	Yelchenahalli	1	1	**2**
186	Jaraganahalli	1	1	**2**
187	Puttenahalli	1	1	**2**
188	Bilekahalli	1	1	**2**
189	Hongasandra	2	1	**3**
190	Mangammanapalya	2	1	**3**
191	Singasandra	2	1	**3**

Ward No.	WARD NAME	WET Waste Compactor (10 Tonnes)	Reject + Mixed Waste Compactor (10 Tonnes)	TOTAL COMPACTORS (10 Tonnes)
192	Begur	2	2	**4**
193	Arakere	2	1	**3**
194	Gottigere	2	1	**3**
195	Konankunte	1	1	**2**
196	Anjanapura	1	1	**2**
197	Vasanthpura	2	2	**4**
198	Hemmigepura	2	2	4
	Total	**319**	**212**	**531**

Annexure 5

List of Dumpsites in the City for Rehabilitation and Operation and Maintenance

S No.	Locations	Area	Status
14.	Mavallipura	138 acres	
15.	Kannur	10 acres	
16.	Mandur	135 acres	No Processing > No Landfill, WTE is under planning
17.	Bidadi	75 acres	Compost, RDF and SLF operational by Private Party
18.	Bellahalli quarries		Dumping going
19.	Kannuru quarries		Dumping going on
20.	mittangahalli		Dumping Going on
21.	doddabidarakallu		Dumping going on
22.	Chikkanamngala		310 TPD No landfill Now
23.	Kcdc at hsr layout		110 TPD No landfill Now
24.	Subarayanpalya		Closed
25.	Seegahalli		Closed
26.	Ligadhirnahalli		Closed

Annexure 6

List of Wet Processing Plants along with Details

1. TPD Bio methanation Plant at Koramangala.

SL NO.	PARTICULARS	DETAILS
1	Location	Koramangala Transfer Station
2	Area	2 Acres (Approx)
3	Year of Commencement	2015
4	Operator	Carbonlites (Carbon Masters), BBMP
5	Zones Covered	Nearby area and vegetable markets
6	No of workers for operatingthe plant	2 to 5 (Approx)
7	Imagery portrays	

2. 350 TPD – Processing Plant at Karnataka Compost Development Corporation (KCDC)

SL NO.	PARTICULARS	DETAILS
1	Location	Hosapalaya, Muneshwara Nagar
2	Coordinates	Latitude: 12.8935 Longitude:77.652
3	Year of Commencement	2015
4	Operator	BBMP
5	Zones Covered	Bommanahalli (16 wards)
6	Area of Plant (in acres)	29 acres
7	Designed Capacity (mixedwaste)	500TPD

<table>
<tr><td>8</td><td>Current Operating Capacity(wet waste)</td><td colspan="3">350TPD</td></tr>
<tr><td>11</td><td>Existing Facilities</td><td colspan="3"><table>
<tr><th>NAME OF FACILITY</th><th>YES / NO</th><th>REMARKS</th></tr>
<tr><td>Compound wall</td><td>yes</td><td>(Not in all the periphery)</td></tr>
<tr><td>Security room</td><td>Yes</td><td>For 7 Marshals</td></tr>
<tr><td>Weighing Bridge</td><td>Yes</td><td></td></tr>
<tr><td>Preparatory section</td><td>Yes</td><td></td></tr>
<tr><td>Windrows</td><td>Yes</td><td></td></tr>
<tr><td>Refinement Section</td><td>Yes</td><td></td></tr>
<tr><td>LTP</td><td>No</td><td></td></tr>
<tr><td>Biomethantion plant</td><td>yes</td><td>5TPD (not in operation)</td></tr>
<tr><td>Workshop</td><td>yes</td><td>15m*40m</td></tr>
</table></td></tr>
<tr><td>12</td><td>No of workers for operatingthe plant</td><td colspan="3">55(Some of BBMP and Some of Contractor)</td></tr>
<tr><td>13</td><td>Supervision In charge</td><td colspan="3">BBMP</td></tr>
<tr><td>14</td><td>Satellite Image</td><td colspan="3">
</td></tr>
</table>

3. 350 TPD Processing Plant at Chikkangamangala

<table>
<tr><th>SL NO.</th><th>PARTICULARS</th><th colspan="3">DETAILS</th></tr>
<tr><td>1</td><td>Location</td><td colspan="3">Silicon town</td></tr>
<tr><td>2</td><td>Coordinates</td><td colspan="3">Latitude: 12.86
Longitude:77.6858</td></tr>
<tr><td>3</td><td>Year of Commencement</td><td colspan="3">2015</td></tr>
<tr><td>4</td><td>Operator</td><td colspan="3">BBMP</td></tr>
<tr><td>5</td><td>Zones Covered</td><td colspan="3">waste coming from South Bangalore, (35-40 trucks).</td></tr>
<tr><td>6</td><td>Area of Plant (in acres)</td><td colspan="3">25 acres</td></tr>
<tr><td>7</td><td>Designed Capacity (mixed waste)</td><td colspan="3">500TPD</td></tr>
<tr><td>8</td><td>Current Operating Capacity (wet waste)</td><td colspan="3">350TPD</td></tr>
<tr><td>9</td><td>Existing Facilities</td><td colspan="3"><table>
<tr><td>NAME OF FACILITY</td><td>YES / NO</td><td>REMARKS</td></tr>
<tr><td>Compound wall</td><td>yes</td><td>(Not in all the periphery), there exits dump yard too where the waste is stored for 1 year</td></tr>
<tr><td>Security room</td><td>Yes</td><td>For 7 Marshals</td></tr>
<tr><td>Weighing Bridge</td><td>Yes</td><td></td></tr>
<tr><td>Preparatory section</td><td>Yes</td><td></td></tr>
<tr><td>Windrows</td><td>Yes</td><td></td></tr>
<tr><td>Refinement Section</td><td>Yes</td><td></td></tr>
<tr><td>LTP</td><td>yes</td><td>new</td></tr>
<tr><td>Biomethantion plant</td><td>No</td><td></td></tr>
<tr><td>Workshop</td><td>yes</td><td>Vehicle wash only</td></tr>
<tr><td>Green belt</td><td>yes</td><td></td></tr>
</table></td></tr>
<tr><td>10</td><td>No of workers for operating the plant</td><td colspan="3">45-50(Some of BBMP and Some of Contractor)</td></tr>
<tr><td>11</td><td>Supervision In charge</td><td colspan="3">BBMP</td></tr>
</table>

12	Satellite Imagery	

4. 100 TPD Processing Plant Lingadheeranalli

SL NO.	PARTICULARS	DETAILS
1	Location	Nice road park, Gottigerepalya
2	Coordinates	Latitude: 12.8762 Longitude:77.5061
3	Year of Commencement	2015
4	Operator	BBMP(previously IL&FS used to operate)
5	Zones Covered	waste coming from East Bangalore, (9-10 trucks daily).
6	Area of Plant (in acres)	09 acres
7	Designed Capacity (mixed waste)	500TPD
8	Current Operating Capacity (wet waste)	100TPD
9	Existing Facilities	NAME OF FACILITY / YES / NO / REMARKS Compound wall: yes Security room: Yes — For 6 Marshals Weighing Bridge: Yes Preparatory section: Yes Windrows: Yes Refinement Section: Yes LTP: No Biomethantion plant: No Workshop: No Green belt: yes
10	No of workers for operating the plant	25-18(Some of BBMP and Some of Contractor)

11	Supervision In charge	BBMP
12	Satellite Imagery	

5. 100 TPD Processing Plant at Subbarayanapalya

SL NO.	PARTICULARS	DETAILS
1	Location	Subbarayanapalya, Sreengupalli, Chikellur Ramapura (Industrial Area)
2	Coordinates	Latitude: 12.8827 Longitude:77.4324
3	Year of Commencement	2015
4	Operator	BBMP
5	Zones Covered	Madhevpura
6	Area of Plant (in acres)	25 acres
7	Designed Capacity (mixed waste)	200TPD
8	Current Operating Capacity (wet waste)	100TPD
9	Existing Facilities	

NAME OF FACILITY	YES / NO	REMARKS
Compound wall	Yes	
Security room	Yes	For 6 Marshals
Weighing Bridge	Yes	
Preparatory section	Yes	
Windrows	Yes	
Refinement Section	Yes	
LTP	No	
Biomethantion plant	No	
Workshop	No	
Green belt	yes	

10	No of workers for operating the plant	16
11	Supervision In charge	BBMP / Jt. Commissioner, Madhavpura Zone
12	Satellite Imagery	

6. 150 TPD Processing Plant at Kannahali

SL NO.	PARTICULARS	DETAILS
1	Location	Kannahalli
2	Coordinates	Latitude: 12.9692 Longitude:77.4468
3	Year of Commencement	2015
4	Operator	Sateram (CA signed in 2021 for 31 years)
5	Zones Covered	Malleshawaram area, West Zone (30 Compactors)
6	Area of Plant (in acres)	22 acres
7	Designed Capacity (mixed waste)	150TPD(as this site was planned to have a landfill)
8	Current Operating Capacity (wet waste)	350TPD
9	Existing Facilities	

NAME OF FACILITY	YES / NO	REMARKS
Compound wall	yes	
Security room	Yes	For 6 Marshals
Weighing Bridge	Yes	
Preparatory section	Yes	
Windrows	Yes	
Refinement Section	No	
LTP	yes	MVR Technology

		Biomethanatio nplant	No	
		Workshop	No	
		Green belt	yes	
10	No of workers for operating the plant	16(Some of BBMP and Some of Contractor)		
11	Supervision In charge	BBMP		
12	Satellite Imagery			

7. 150 Processing Plant at Doddabidarakallu

SL NO.	PARTICULARS	DETAILS		
1	Location	RR Nagar		
2	Coordinates	Latitude: 13.0331 Longitude:77.4798		
3	Year of Commencement	2015		
4	Operator	BBMP		
5	Zones Covered	Dasarali		
6	Area of Plant (in acres)	9.5		
7	Designed Capacity (mixed waste)	150TPD		
8	Current Operating Capacity (wet waste)	100TPD		
9	Existing Facilities	NAME OF FACILITY	YES / NO	REMARKS
		Compound wall	yes	
		Security room	Yes	For 6 Marshals
		Weighing Bridge	Yes	
		Preparatory section	Yes	
		Windrows	Yes	
		Refinement Section	Yes	

		LTP	No	
		Bio methanation plant	No	
		Workshop	yes	
		Green belt	No	
10	No of workers for operating the plant	35		
11	Supervision In charge	BBMP		
12	Satellite Imagery			

8. 200 TPD Processing Plant at Seegehalli

SL NO.	PARTICULARS	DETAILS
1	Location	Seegehalli
2	Coordinates	Latitude: 12.9737 Longitude:77.4474
3	Year of Commencement	2015
4	Operator	BBMP
5	Zones Covered	RR Nagar (15-20 Compactors come every day)
6	Area of Plant (in acres)	7
7	Designed Capacity (mixed waste)	200TPD
8	Current Operating Capacity (wet waste)	120TPD

<table>
<tr><td>9</td><td>Existing Facilities</td><td>
<table>
<tr><th>NAME OF FACILITY</th><th>YES / NO</th><th>REMARKS</th></tr>
<tr><td>Compound wall</td><td>yes</td><td></td></tr>
<tr><td>Security room</td><td>Yes</td><td>For 6 Marshals</td></tr>
<tr><td>Weighing Bridge</td><td>Yes</td><td></td></tr>
<tr><td>Preparatory section</td><td>Yes</td><td></td></tr>
<tr><td>Windrows</td><td>Yes</td><td></td></tr>
<tr><td>Refinement Section</td><td>Yes</td><td></td></tr>
<tr><td>LTP</td><td>No</td><td></td></tr>
<tr><td>Biomethanation plant</td><td>No</td><td></td></tr>
<tr><td>Workshop</td><td>No</td><td></td></tr>
<tr><td>Green belt</td><td>No</td><td></td></tr>
</table>
</td></tr>
<tr><td>10</td><td>No of workers for operating the plant</td><td>No clarity</td></tr>
<tr><td>11</td><td>Supervision In charge</td><td>BBMP</td></tr>
<tr><td>12</td><td>Satellite Imagery</td><td>
</td></tr>
</table>

9. 750 TPD Processing & Disposal Facility at MGSP - Chiguranahalli

<table>
<tr><th>SL NO.</th><th>PARTICULARS</th><th>DETAILS</th></tr>
<tr><td>1</td><td>Location</td><td>MSGP Waste Tech Park, Chiguranahalli, Doddaballapur</td></tr>
<tr><td>2</td><td>Coordinates</td><td>Latitude: 13.3188
Longitude: 77.353</td></tr>
<tr><td>3</td><td>Year of Commencement</td><td>2013</td></tr>
<tr><td>4</td><td>Operator</td><td>MSGP Infratech Pvt. Ltd.</td></tr>
<tr><td>5</td><td>Area covered</td><td>Bulk waste Generators and Waste transported by BBMP</td></tr>
<tr><td>6</td><td>Area of Plant (in acres)</td><td>75 Acres</td></tr>
<tr><td>7</td><td>Model of Operation</td><td>Tipping Fee Model</td></tr>
<tr><td>8</td><td>Current Operating Capacity (mixed waste)</td><td>750 TPD</td></tr>
<tr><td>9</td><td>Existing Facilities</td><td>
<table>
<tr><th>NAME OF FACILITY</th><th>YES / NO</th><th>REMARKS</th></tr>
<tr><td>Compound wall</td><td>yes</td><td></td></tr>
<tr><td>Security room</td><td>Yes</td><td></td></tr>
<tr><td>Weighing Bridge</td><td>Yes</td><td></td></tr>
<tr><td>Preparatory section</td><td>Yes</td><td></td></tr>
<tr><td>Windrows</td><td>Yes</td><td></td></tr>
<tr><td>Refinement Section</td><td>Yes</td><td></td></tr>
<tr><td>LTP</td><td>No</td><td></td></tr>
<tr><td>Biomethanation plant</td><td>No</td><td></td></tr>
<tr><td>SLF</td><td>yes</td><td></td></tr>
<tr><td>Workshop</td><td>Yes</td><td></td></tr>
<tr><td>Green belt</td><td>yes</td><td></td></tr>
</table>
</td></tr>
<tr><td>10</td><td>No of workers for operating the plant</td><td>50 to 75</td></tr>
</table>

11	Satellite Imagery	

The waste processing facility situated in MSGP Waste Tech Park, Chiguranahalli, Doddaballapur, has been operational since 2013 and is managed by MSGP Infratech Pvt. Ltd. This facility primarily serves bulk waste generators and waste transported by BBMP. It covers an expansive area of 75 acres.

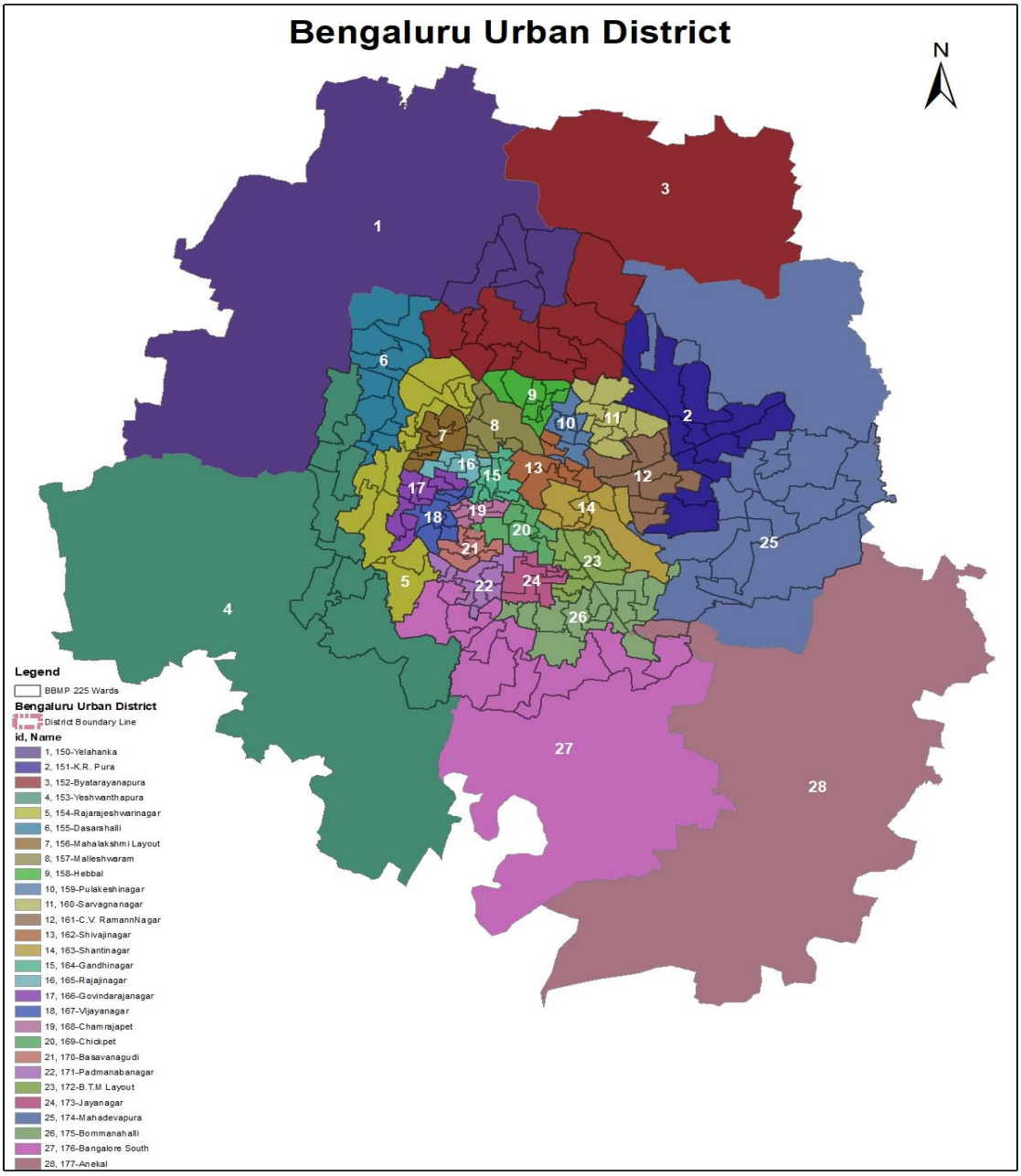
The facility adopts a Tipping Fee Model for its operations and currently has a mixed waste operating capacity of 750 Tons Per Day (TPD). Existing facilities at the site include a compound wall, a security room, a weighing bridge, a preparatory section, windrows for waste management, a refinement section, and a workshop. It also maintains a sanitary landfill (SLF) and a green belt.

Challenges at the site are related to local issues, and there are physical limitations, particularly regarding the proper utilization of land and the maintenance of the sanitary landfill, which is not being handled adequately.

Annexure 7

Proposed Transfer Station and Processing Facility

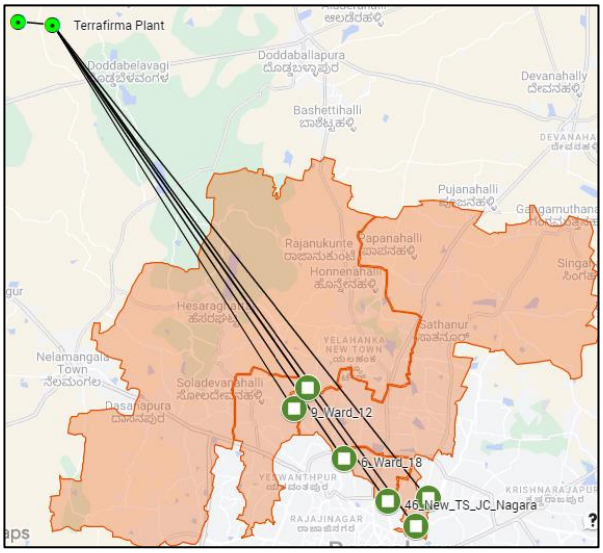
The Map below depicts the total project area of Bangalore Urban District and BBMP area.



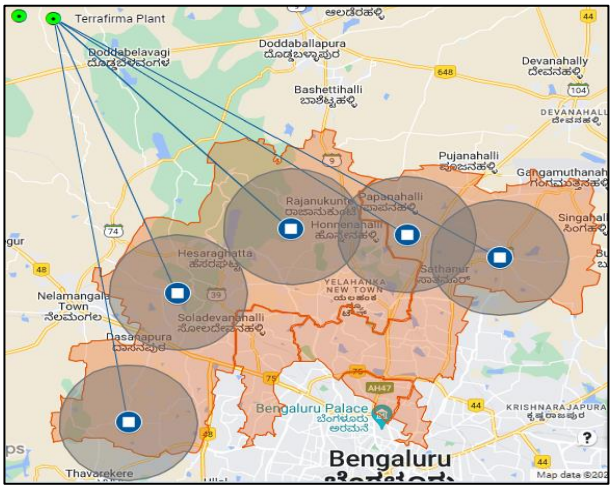
Not to Scale

Tentative location of the Package wise Processing plant locations and Transfer station locations within package boundary

Package 1

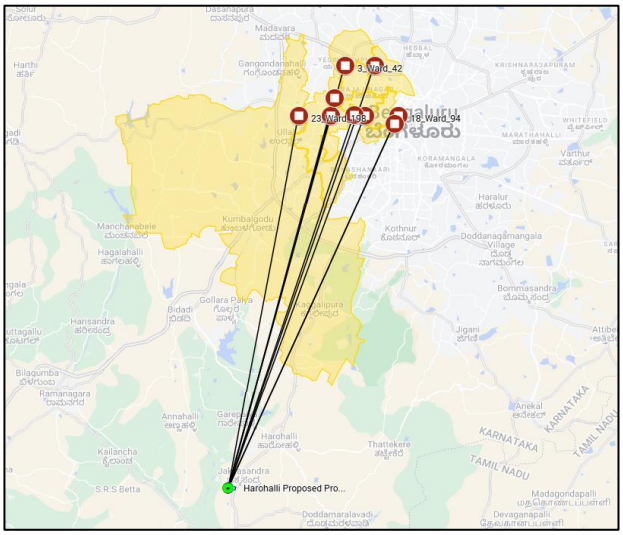


North Zone	
Divisions	**Transfer Station**
6	11
	12
	18
	46(New TS at JC nagar)
	60 (New TS at Kadugondanahalli)
	78 (New TS at Pulikeshinagar)

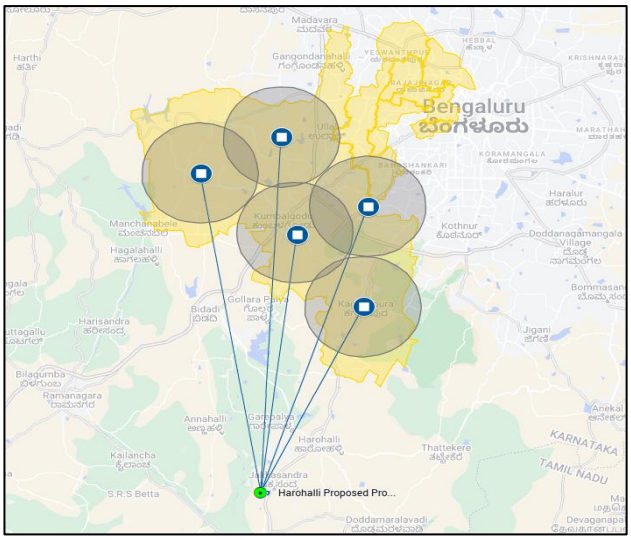


Additional Transfer Station for Covering the Rural Zones

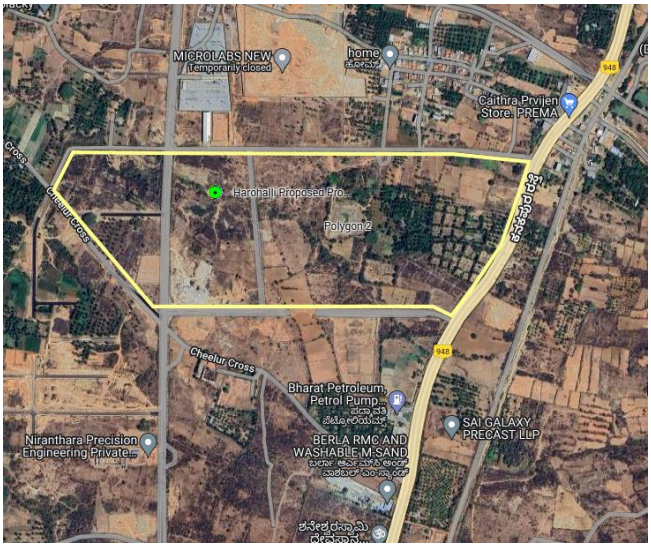
Package 2



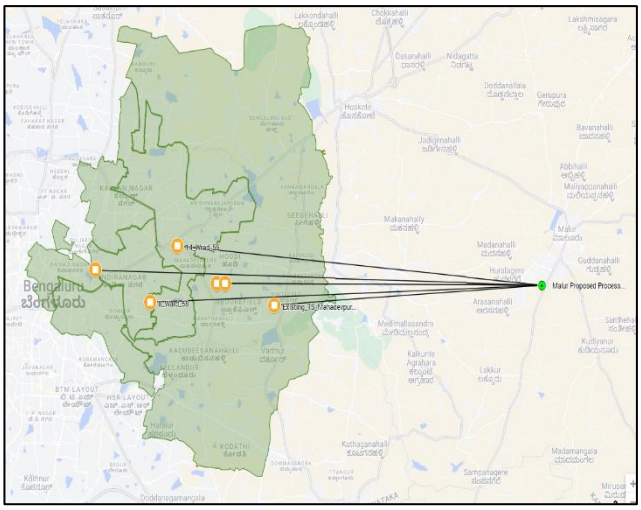
West Zone	
Divisions	**Transfer Station**
9	65 (New TS at malleshwaram)
	42
	73
	Existing TS at Chickpet(171,172,173,174,165)
	198
	94
	13
	44
	125(New TS at Govindaraj nagar)



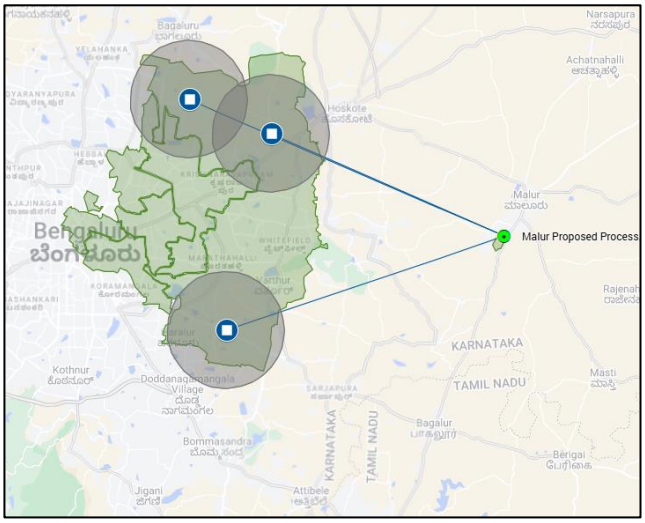
Additional Transfer Station for Covering the Bengaluru Urban District



Package 3

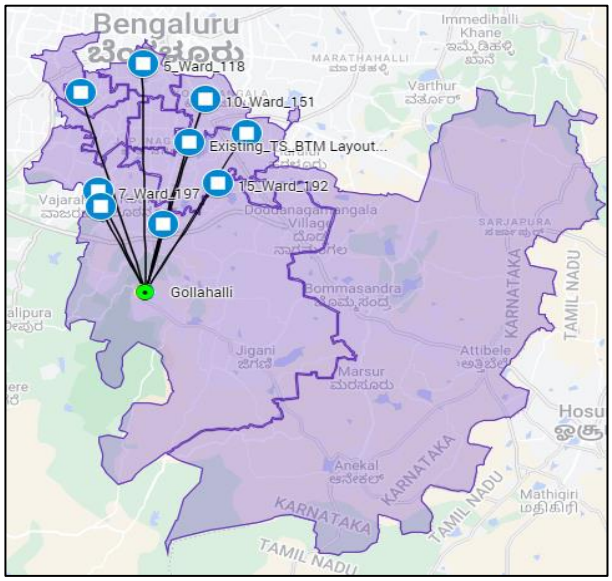


East Zone	
Divisions	**Transfer Station**
6	90
	Existing TS at Mahadevpura(107,108,109,110,113,114)
	85
	56
	58
	149

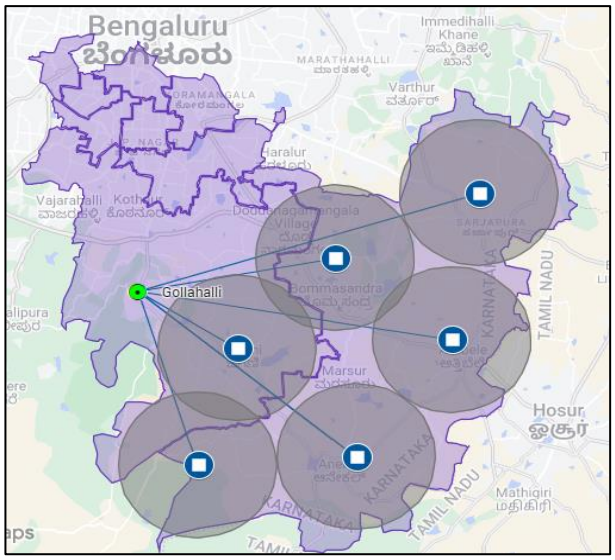


Additional Transfer Station for Covering the Bengaluru Urban

Package 4



South Zone	
Divisions	**Transfer Station**
9	118
	197
	151
	192
	196
	194
	162 (New TS at Girinagar)
	Existing TS at BTM Layout (182,183,184,185,186,187,191)
	174 (New TS at HSR Layout)



Additional Transfer Station for Covering the Bengaluru Urban District